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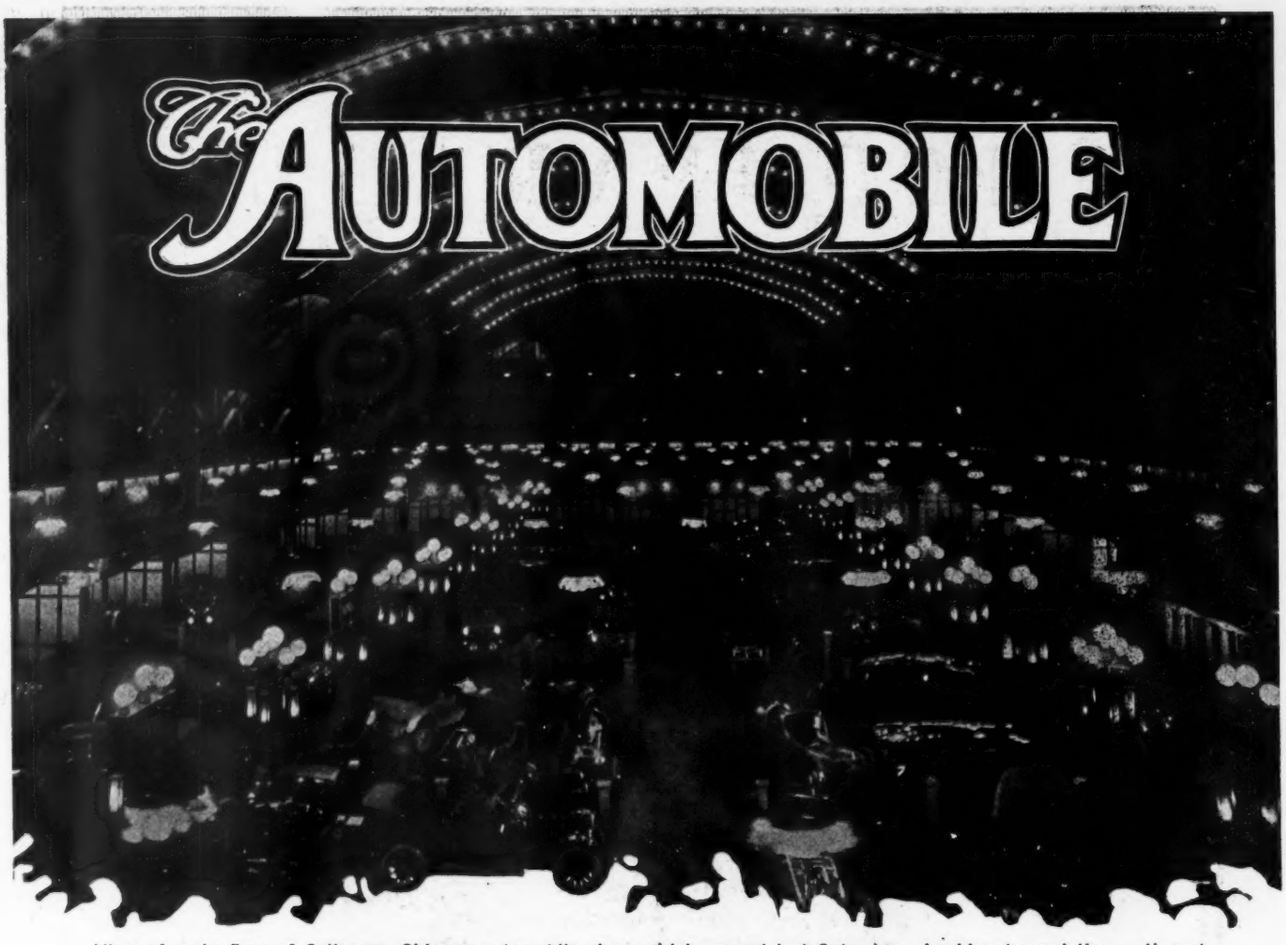

View of main floor of Coliseum, Chicago automobile show which opened last Saturday. Looking toward the south end

Chicago the Automobile Mecca

Thirteenth Annual Exhibit Surpasses Any Previous Exhibition Biggest Automobile Show Held in this Country

CHICAGO, ILL., Feb. 3—Thirteen is a lucky number for automobile Chicago. The Thirteenth Annual Automobile Show, held in 1913, which opened its doors last Saturday night is the biggest exhibition of motor vehicles the city of Chicago, or the entire country for that matter, has ever known, on a total floor space of 147,990 square feet. The passenger car exhibits outnumber those at the recent great national show at New York by eleven makes, Chicago having a total of ninety-nine to New York's eighty-eight. This year's Chicago show surpasses that of 1912 in the matter of passenger car exhibits by three. For the second week of the show there will be seventy-six makes of commercial vehicles on exhibition, seventy-two gasoline trucks and six electric vehicles. As compared with the New York show this indicates a total numerical superiority of eleven makes for the Windy City. At New York there were six exhibitors of electric trucks though there were only fifty-nine makers of gasoline-propelled machines. Chicago is to have eleven trucks more this year than in the 1912 show which had a total of sixty-five, or the same as in New York in 1913. The increase in commercial vehicles at Chicago, which is justly considered as the distributing center of the Middle West, might be taken to indicate that the manufacturers of these vehicles expect a still greater market for their product in the growing cities of the western states than in the crowded municipalities of the East.

In the way of accessory exhibits, there are 205 makers of accessories represented during the first week of the show, as compared with 340 which had space in New York. Probably this difference in favor of the Metropolitan exhibition is due to the large number of small accessory in the vicinity of New York and in New England which considered the trip to Chicago too great an expense in time and money to pay for the advantage of being represented at the show. During the second week of the Chicago exhibition there will be 133 accessory exhibitors, twenty-four of whom were not present the first week of the show. There were 141 makers represented in New York which did not show in Chicago.

The show is held in the Coliseum proper, the Coliseum annex, the basement of the Coliseum and the Wilson building, which form one group, being practically under one roof, and the First Regiment Armory. To reach the latter from the Coliseum, it is

View across the Coliseum, showing arrangement of the cars on the main floor, accessory exhibits in the gallery, decorative scheme and lighting of the gigantic exhibition hall

necessary to traverse an alleyway about 100 yards long but the management has protected this from the weather by roofing it over with canvas.

The show is held under the auspices of the National Association of Automobile Manufacturers and is under the immediate direction of Major Samuel A. Miles, who has so successfully staged the greatest American automobile shows since the inception of the custom of holding annual national displays of motor vehicles.

The show was opened to members of the trade at 1 o'clock Saturday afternoon, but the general public was not admitted until 6.30 when a steady stream of humanity poured into the Coliseum and from there down the canvas-roofed alley-way to the armory in spite of the weather, which was by far the coldest of the winter, the thermometer standing only a few degrees above zero all day and dropping a little in the evening.

There were a great many first-nighters, of course, people who came to see the show purely and simply as a spectacle, but there were also a goodly representation of the class which comes to see and to learn. These inspected the cars intelligently and their inquiries showed a considerable interest in their construction and some understanding of the present trends and the developments of the past year.

The main features of design in which the cars shown at Chicago differ from those of 1912 are the same as those which attracted attention at the New York shows, and have been fully reviewed in THE AUTOMOBILE for January 9 and for January 16. The public in Chicago, or at least that part of it which attended the opening of the show, took the same interest in these tentative indications of the car of the future and asked the same questions which were in the mouths of the show public in New York. The same curiosity was manifested in the cranking devices, the greatest interest centering in the electric types, wire wheels excited the same comments and inquiries while remarks on the improvements in body design were frequent. A few observed the tendency toward standardization of the medium-sized wheel and a great many commented on the large proportion of six-cylinder cars shown as compared with last year. The six seems a universal favorite, from the sentiments expressed by the majority of the people on attending the opening night

One of the panels above the accessory gallery, showing the leaded glass effect, somewhat similar to the appearance of old cathedral windows

The Decoration Scheme

THE dominant idea in the decoration of the Chicago Automobile Show which opened last Saturday night is that of cathedral glass and stained window effects. This theme is carried out consistently throughout the decorations, even the lighting giving a somewhat dim and semi-religious atmosphere which is exceedingly novel for an automobile show, but which bestows upon it an air of quiet simplicity enriched by the artistic quality of the mural decorations. In fact, this year's effects are especially welcome as a change from the extremely ornate decorative scheme employed last year. The principal features at the Coliseum are found in the ceiling and on the balcony front.

Great arches of lights strung across ceiling produce a very pleasing effect. The numerous bulbs suspended from the ceiling may be readily seen in the above illustration

of the show. Many of the people showed an interest in the unit power plant, the position of the gear-box, type of suspension of motor and gear-box, drive of magneto and lighting generator and other details. Some were interested in the adoption of left drive, generally expressing a liking for center control, though a great many were indifferent as to these details. Demountable rims as standard equipment seemed to be generally in favor.

A canvass of the exhibitors as to whether or not they expected many of their dealers to come to Chicago for the show revealed a considerable diversity of opinion, some of the exhibitors saying that they expected a great many established dealers, some in special excursions, while others stated that most of their dealers are so far from Chicago that probably comparatively few would make their appearance. As for the appointment of new agents, a number of the exhibitors stated that their territory is all closed up, while others expect to appoint a number of new representatives.

It is still too early in the show week to determine whether many sales will be made during the week but from the optimistic reports of some of the exhibitors there may be a great many sales consummated before the close of the show. One exhibitor stated that he sold a car within 2 minutes of the opening of the doors.

Each of the many panels of this description shows a tremendous amount of painstaking care not usually found in ephemeral decorations

The Decoration Scheme

THE balcony front in itself produces an extremely pleasing effect the full length of 1000 feet being beautified by panels depicting rural scenes, three of these being shown in each of the 26 sections between the girders of the building. The settings of these pictures are massive, much like the old-fashioned frames of pictures to be seen in ancient buildings in Europe. The general impression produced is one of dignity and beauty. The center of the building is decorated in a very simple manner, practically all of the space being given up to the cars. Ornamental posts bound the various exhibits, each post supports a cluster of large milk-white light globes as well as a number of cathedral lanterns.

The decoration scheme employed is described in full on pages 400 and 401. A band furnishes music while the show is in progress in the Coliseum while orchestras drown the shuffling of feet as the crowds throng through the other buildings.

Chicago has greater floor-space for the annual automobile show this year than ever before, the Coliseum, Coliseum annex and basement, the Wilson building and the First Regiment Armory giving a total available space of 147,990 square feet as compared with 89,000 square feet available last year. Only 135,615 square feet will be required during the second week as the makers of commercial vehicles are still fewer in number than the manufacturers of passenger cars. In the number of exhibits, this year's show comprises ninety-nine displays of passenger cars and 244 accessory stands. There will be seventy-six makes of commercial vehicles represented during the second show week and 200 makers of accessories. All in all, Chicago's

1913 exhibition is the largest, as regards the number of cars on view, that has ever been held in America.

An idea of the compactness of the exhibits can be gained by a comparison with the recent New York show at which eighty-eight passenger car and 379 motorcycle and accessory exhibits occupied some 275,000 square feet of floor-space, or nearly twice the total floor-space available at the Chicago exhibition. The New York show, as a matter of fact, exceeded the great Paris display in floor-space by some 15,000 square feet. In Chicago, of course, it must be taken into consideration that the motorcycle manufacturers and dealers are conducting a separate show in the Furniture Exposition building on South Michigan avenue, whereas in New York these machines helped to swell the grand total of exhibitors.

Of course, there are several companies, which from failure to get space or for some other reason, decided to hold separate shows of their respective lines in their own showrooms during the 2 weeks of the show. The same plan was adopted in New York by about ten makes. Among those conducting individual shows in this manner in Chicago there are the Apperson, Empire, Marion, Detroiter, Ford and the Howard six. The latter is a new car, introduced to the public during the past week.

One of the great features of the Chicago show is the fact that a goodly representation of the electric cars is gathered together, sixteen makes in all, or 57.1 per cent. of the industry, twelve makes being housed together in the armory, while four others are given space in the basement of the Coliseum. Those in the armory are: Anderson, Argo, Baker, Borland-Grannis, Broc, Buffalo, Columbus, Ohio, Rauch & Lang, R. C. H., Waverley and Woods. In the Coliseum basement are: Century, Chicago, Church-Field and Standard.

One of the combination light posts and exhibit name plates. The name of the exhibitor is on a leaded glass transparency and stands forth clearly against the background

Twelve of these makes of electric were not exhibited at the New York show, the only manufacturers showing there being those of the Buffalo, Church-Field, Columbus, Hupp-Yeats and Standard. This shows the pre-eminence of Chicago as a city for electrics, 42.7 per cent. of the electric passenger vehicle industry being represented at the Chicago show while only 18.5 per cent. of the makers thought it worth while to display their lines at New York. Of course, it must be remembered that one reason for the small number of electric exhibits at the metropolitan show was the fact that many of the makers had space at the big electrical show held there October 9-19 and that, still later, the dealers held a litte electric pleasure vehicle show of their own.

A new feature of the electric car displays this year is the exhibition of chassis. Heretofore, the makers and dealers said that there was no use in exhibiting electric car chassis as the chief buyers of this type of vehicles are women, who are interested in body fittings and appointments rather than in mechanical features of construction. Apparently either the women are beginning to take an interest in something besides the mere external appearance and comfort of the electric passenger vehicle or else the many advantages of these cars for city use, combined with the rising price of gasoline, have begun to make a strong appeal to the masculine element of the population. The interest manifested in these electric chassis at the show and the appreciation evinced by the people inspecting them indicated that the innovation is of value and that it will be a feature of future exhibitions.

Curiously enough, the number of makes of gasoline cars exhibited at Chicago which

South end of the Coliseum giving an idea of the decoration at the end of the hall and depicting a grand stairway in keeping with the rest of the decorative scheme

Quarter view across center aisle of the Coliseum, showing how compactly the cars are arranged and giving an idea of the lighting scheme and the arrangement of the cars

did not appear at the New York show is exactly the same as the number which were represented at New York but which do not have space in Chicago. These cars, it is interesting to note, are all of different makes, that is, each list is made up of different names. Those shown at Chicago which did not appear in New York are: Austin, Colby, Crow-Elkhart, Glide, Great Western, McIntyre, Midland, Pratt-Elkhart and Staver. On the other hand, those present at the New York show which are not represented at the Windy City exhibition are: Detroiter, Empire, Havers, Keeton (the Canadian car), King, Lenox, Marion, Only and Cunningham.

It is significant to observe that for the first time the old-time line of demarcation between the products of the East and those of the West is not to be found this year at the Chicago show. In former years it was, for the most part, the cars of the East for the East but the cars of the West for the West. Now, however, with the standardization of automobile construction made possible to a large extent by the greatly improved condition of the roads throughout the country, there is no longer any necessity for embodying different principles in cars for the West from those followed in designing cars for any other part of the country. A study of the list of the cars which did not show at New York but which are represented at Chicago would seem to indicate that, as most of them are cars made in the Middle West, there would be some difference in construction, but while these cars are apparently built for Western rather than Eastern trade an inspection reveals no radically different ideas applied to the mechanical details. As a matter of fact, great numbers of these cars are sold in the East. Looking at the list of makes which were represented in New York but which are not found at the Chicago exhibition, we find a mixed assemblage of several cars made in the East, about as many in the Middle West and one Canadian make. All of the cars, both those which appeared in New York and those which are on view in Chicago were fully described in the January 9 issue of THE AUTOMOBILE.

One of the lighting posts placed between the exhibit spaces, showing milk colored glass globes and cathedral lantern lights throwing soft glow about the neighboring exhibits and at the same time fitting in well with the general decorative scheme of the exhibition room

One respect in which the Chicago show of 1913 differs from that of last year is in the absence of foreign-made cars. In the 1912 exhibition several of these were represented, among them the Renault and the Darracq. This year the Renault, Metallurgique and other foreign creations are to be seen only at their respective salesrooms. Chicago has never been a very good market for the machines built across the ocean but apparently the stability and value of the American-made automobile are making more and more of the people of the Windy City ask "What is the use of buying a European car when you can get a good car built in a factory nearer to the purchaser than the width of the Atlantic Ocean?"

Manufacturers can do much more by way of accessibility of grease cups, brake adjustments and other adjustments than they are doing at present, this being particularly so in respect to brakes and grease cups. The most inaccessible grease cups are those around the rear axle and universal joints of the propeller shafts. On some chassis eight to ten grease cups have been counted on a rear axle and of these not a solitary one is accessible in some makes of cars. It is a prima facie case of where the designing engineer does not drive his own car, or, if he drives, then the grease cups are always prepared for him by some mechanic, so that so far as he is concerned he does not know that grease cups exist. There are half a dozen makers who are now fitting grease

(*Continued on page* 436.)

Pennsy To Reduce Fees

Quakers May Draft City Regulation To Formulate Own Speed Limit—Badgers for Rigid Law

Findlay Works May Be Changed — Buffalo Companies Accused of Violating Tax Law

PHILADELPHIA, PA., Feb. 3—A number of proposed bills have been prepared and are ready for introduction before the Pennsylvania legislature making new regulations for motor trucks. It is proposed to increase the license fees on trucks, because of their greater wear and tear on streets and roads. They now pay $5, $10 or $15 according to their horsepower, the same as pleasure vehicles.

The city of Philadelphia will ask the right to make its own rules for motor cars, irrespective of the uniform state law. Organized motorists will fight this. Under the present law the speed limit in the country is 24 miles an hour and in built-up sections 12, and no municipality can enforce other limits.

There is prospect of a fight over the licensing of drivers. The present law requires a license of every person desiring to operate a motor vehicle as a chauffeur or paid operator. The State highway department contends that this includes every one driving a car except the owner who has paid a license fee for the car. The Pennsylvania Motor Federation got a decision from the Philadelphia courts that "chauffeur" and "paid operator" were one and the same. The department sticks to its requirement that members of an owner's family or other who wish to drive must obtain drivers' licenses. The Federation has advised its members to disregard the department's requirement.

The Federation is prepared to amend the law to provide beyond question that only paid drivers require licenses. On the other hand an effort will probably be made to prohibit any one from operating an automobile except after examination and licensing as in Massachusetts. All motor organizations will oppose this.

The motorists will renew their efforts of previous sessions to get a law compelling all vehicles to carry lights at night. The Grangers have succeeded in beating this bill in the past. On the other hand the automobilists anticipate having to fight an effort to raise the fees on pleasure vehicles. Their organization had a hard fight 2 years ago to defeat a bill to increase the minimum from $5 to $25 and the maximum from $15 to $75. The present rates bring in a revenue of nearly $1,600,000 a year.

Omnibus Bill Proposed in Wisconsin

MILWAUKEE, WIS., Feb. 3—Stirred to action by the unusual flood of bills in the present Wisconsin legislature, which relate to the use and operation of motor cars, the various organizations of Milwaukee and Wisconsin representing dealers, manufacturers and private owners, held a conference at the Hotel Pfister in Milwaukee on February 1, and outlined plans for a determined fight against such bills as are deemed bad and indifferent. It is believed that the outcome of the conference will be the presentation to the Legislature of an omnibus bill covering every possible angle of the question. In fact, a special committee was appointed, with James T. Drought, secretary of the Wisconsin State A. A., and counsel of the Milwaukee A. C. and W. S. A. A., as chairman, to frame the omnibus bill and see to it that it is introduced in the regular form and note made of the fact that the bill has the solid backing of the motoring interests of Milwaukee. The principal demands will be for a universal light law; uniform signal law; a single annual registration and license fee for every owner, instead of one for each car owned at any time during one year; jail sentence for thieves; more severe penalty for joy riders, and more considerate laws covering the liability of motorists in cases of accidents.

A noteworthy bill, already introduced, and which will be made an amendment in the proposed omnibus bill, is that of Assemblyman I. N. Stewart, of Appleton, who proposes to make the punishment for the theft of a motor car for any purpose not less than 1 nor more than 15 years in prison. This makes the penalty for motor car stealing equal to that for horse stealing.

Assemblyman Conway has a bill which provides that a motor car passing any vehicle on the public highway at a closer distance than 6 feet must slow down to a speed of 10 miles per hour.

The proposed section covering signals, in the omnibus bill, will attempt to require every owner to equip his car with a horn sounding a harsh, abrupt tone, which will thenceforth be distinctive of motor vehicles. The bulb-horn will be made illegal by the proposed statute.

May Reorganize Findlay Company

FINDLAY, O., Feb. 3—J. G. Cleary, of Milwaukee, Wis., who recently purchased the Findlay Motor Works for $50,000, which was sold under direction of the United States Court, is in the city talking about reorganizing the company and beginning operations at once. At first he contemplated removing the machinery to Milwaukee.

Suits Against Buffalo Concerns

BUFFALO, N. Y., Feb. 4—John Lord O'Brian, United States Attorney, filed the past week suits for $10,000 each against four automobile concerns of Buffalo. The motor firms are charged with violating the federal corporation tax law, which requires a statement from all corporations, giving also the amount of business done. This statement is used as a basis for levying a tax. In the papers filed by Mr. O'Brian it is charged that the defendants have neglected to file a statement since 1910. Mr. O'Brian intends to prosecute several other companies for violation of the corporation tax law. Following are local motor firms against which Attorney O'Brian has filed suits: Buffalo Electric Vulcanizers Company, 1219 Main street; the Glidden Garage, 1114 Elmwood avenue; Dixon Motor Car Company, Edward and Main streets, and Werick Brothers, of Cheektowaga, N. Y.

Minnesota Association Directors' Meeting

MINNEAPOLIS, Feb. 3.—The directors of the Minnesota State Automobile Association will clear up a lot of work at their annual meeting February 11 at the Hotel Radisson. In the evening they will be entertained by the Automobile Club of Minneapolis at a dinner. Asa Paine, vice-president of the A. A. A., will be in charge of the dinner. The officers are to report, and good roads and pending automobile legislation will be discussed. The question of road signs and the annual tour will arise. Having completed posting the road to Watertown, S. D., from the Twin Cities for connection at Watertown with the Meridian road, other sections will be taken care of. The association at present has thirty-seven club memberships and 3,178 by individuals.

The trustees of the Automobile Club of Minneapolis will meet February 11 at the Hotel Radisson. Pending state legislation on automobile matters will be taken up.

Howard Motor Car on Market

CHICAGO, Feb. 1—Manufactured by the Central Motor Car Company, Connersville, Ind., and marketed by the Howard Motor Car Company, also of Connersville, the Howard Six has just been placed upon the market. After the demise of the Lexington Motor Car Company the old Lexington plant was leased by the Central interests and the manufacture of motor

cars commenced. The first car to be delivered was a demonstrator received two days ago by the McDuffee Automobile Company, Chicago. The McDuffee concern has been appointed distributor for the states of Illinois, Indiana, Michigan, Wisconsin and Iowa. Howard L. Babcock, G. C. Babcock, Harry Tuttle, and C. L. Millard are officers of the sales company. But one model will be turned out for the first series of 500 cars.

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St. Louis Studebaker Center

ST. LOUIS, Feb. 1—The Studebaker Corporation will make this city a central distributing point for all of its automobile lines by establishing a large branch house here. The new branch house will be in charge of Carl G. Simon, and will take in Missouri, Illinois, Tennessee, Arkansas, Mississippi, Louisiana, and a part of Kentucky, Oklahoma and Texas.

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Atlas Foreclosure Affects Merger

SPRINGFIELD, MASS., Feb. 4—*Special Telegram*—With the execution of the foreclosure recently of a second mortgage for $19,400, held by the Union Trust Company of Springfield, Mass., against the Atlas Motor Car Company, also of this city, and the subsequent purchase at public sale of the Atlas plant by C. D. Whitney, manager of the Victor Sporting Goods Company, a new development in the Orson merger proceedings was brought to light. Negotiations have been under way for some time leading to the combining of several Springfield concerns, namely, the Atlas company, the Springfield Metal Body Company, the Brightwood Manufacturing Company and others by the monied interests which fathered the Orson Automobile Company, and which interests are centered around the National City Bank, New York. The Atlas plant, which is about 200 feet deep and three stories in height, was particularly desirable to the promoters of the project since it is conveniently located with respect to the other holdings. Accordingly, the Orson interests put in a bid for the plant, but were outbid by Whitney, who bought it for $55,000, the payment down being very small, it is stated. Since the location and size of the plant were the principal reasons for the New York capital's smiling upon the Atlas Motor Car Company, the Whitney move has put a different face on the matter and it is probable that the merger will not include the Atlas company.

However, the merger plans are very indefinite at present, according to H. M. Kilborn, of the National City Bank, and may not even include the Springfield Metal Body Company, for reasons which are kept under cover. Whitney states that it is the intention of his concern to convert the Atlas factory into a plant for the manufacture of sporting goods, although the Atlas people will be given a reasonable amount of time to remove from the building.

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Smith, Sales Manager of Lozier

DETROIT, MICH., Feb. 3—Paul Smith, former sales manager of the Flanders Motor Company, has been engaged as sales manager of the Lozier Motor Company to succeed C. A. Emise, resigned. Mr. Smith will have full charge of branches and dealers. The announcement is made by President H. M. Jewett, who also denies a rumor which has been current that the interests of the Lozier and the Paige-Detroit concerns were to be merged in the near future.

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Michigan Magneto Creditors Meet

DETROIT, MICH., Feb. 3—Referee in Bankruptcy, Lee M. Joslyn, has sold the property of the Michigan Magneto Company, which recently filed a petition in bankruptcy in the federal court, to Louis Duscoff, of Detroit, for $4,600. The first meeting of the creditors was held last Thursday and a dividend of 7 per cent. was declared.

Maxwell Plan Announced

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Four Maxwell Models To Be Built and Five Models of Old U. S. Motor Continued

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Heir to U. S. Motor and Flanders Has $21,000,000 Operating Capital and No Liabilities

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A FORMAL statement announcing that the Maxwell Motor Company, Incorporated, has taken over property and assets of the U. S. Motor Company, Maxwell-Briscoe Motor Company, Dayton Motor Car Company, Columbia Motor Car Company, Alden-Sampson Manufacturing Company and Brush Runabout Company, has been issued by the New York office of the Maxwell concern, over the name of Carl Tucker, treasurer of the company. In addition to this, the combination of the former U. S. Motor with the Flanders interests is announced.

In this statement, it is declared that the Tarrytown, N. Y., Auburn, Ind., Newcastle, Ind., Detroit, Mich., factories of the two former corporations will now be all operated by the Maxwell company. Four models of Maxwell cars will be built at these plants, as follows: The Maxwell Six, model 50, formerly known as Flanders, being a seven-passenger car and selling for $2,350; the Maxwell Six, model 40, formerly Flanders, a five-passenger touring design which sells for $1,550; Maxwell, model 35, four-cylinder, five-passenger touring car, $1,085; and the Maxwell, model 25, a four-cylinder, five-passenger touring car, the price of which has not been announced yet. All these cars, which cover a range of from 25 to 50 horsepower, will be fully equipped, and the sixes will have electric self-starters fitted to them. For the present season, the Maxwell designs known as models 22—three-passenger roadster—and 40—five-passenger touring car—are being built to fill orders on hand and to respond to the public demand. The Stoddard-Dayton models 30, 38 and 48 will also be continued for the near future. The latter model will be equipped with the Gray & Davis electric starting and lighting system at the option of the purchaser.

The officers of the company, whose names appear on the statement, are: Walter E. Flanders, president; W. F. McGuire, vice-president; W. B. Anthony, comptroller; C. A. Forster, commercial manager; Carl Tucker, treasurer; Jas. C. Brady, Harry Bronner, Eugene Meyer, Jr., Henry Sanderson, Wm. E. Potter, George H. Burr, W. Catchings, Wm. J. Maloney, W. F. McGuire and Walter E. Flanders.

Besides the free property of the affiliated U. S. Motor and Flanders companies, worth $18,000,000, the new Maxwell company, has on hand $3,000,000 cash with which to carry on its manufacturing, selling and service operations. Service departments will be operated at New York City, Chicago, Boston, Philadelphia, San Francisco, Pittsburgh, Los Angeles, Minneapolis, Omaha, Kansas City, Dallas, Atlanta, St. Louis, Indianapolis, Denver, Memphis, Portland, Ore., and Charlotte, N. C. It is understood that the guarantee written by the older companies on their products will be respected by the Maxwell company.

The Maxwell Motor Company, Incorporated, in its statement by Mr. Tucker, announced that it will pay promptly the receiver's obligations for any unpaid invoices dated January 11, 1913, or prior, for shipment received by the following companies:

United States Motor Company, Maxwell-Briscoe Motor Company, Dayton Motor Car Company, Columbia Motor Car Company, Alden-Sampson Manufacturing Company and Brush Runabout Company.

Invoices dated January 13, 1913, and subsequent, will also be paid by the Maxwell Motor Car Company, Incorporated, upon proper advice that the goods have been received and accepted.

Prest-O-Lite Dismissed

New York Court Rules Trademark Invalid on Technicality—Prest-O-Lite Has Filed Application

Will Continue Fight with New Mark Registered—Radical Automobile Law Proposed for Ohio—Colorado Boosters Busy.

JUSTICE SPIEGELBERG, in the Municipal Court of New York City, Borough of Manhattan, Ninth District, dismissed a bill of complaint brought by the Prest-O-Lite Company against the American Auto Supply Company, New York City, claiming violation of section 367 of article 34 of the general business law of the State of New York. This article imposes a penalty of $100 on any person violating the following regulation: .

"Any person or corporation engaged in manufacturing, packing, bottling or selling any article of merchandise, put up by him, for sale in any bottle, vessel, box, package or other receptacle, with his name, trademark, label or private mark appearing in any way thereon, or branded, stamped, affixed, blown or impressed thereon, may file in the office of the Secretary of State and in the office of the County Clerk."

The defendant was stated to have filled empty Prest-O-Lite tanks with acetylene gas produced in searchlight generators, being a customer of the Searchlight Gas Company, and to have sold a tank thus filled to an employee of the plaintiff. Before, however, selling the tank the defendant pasted a label over the word "Prest-O-Lite" on the tank, stating that the tank contained Searchlight gas and not Prest-O-Lite gas.

The essence of the opinon of Justice Spiegelberg is as follows:

The Prest-O-Lite trademark and name were registered in 1898, and when the new trademark regulations were brought out in 1909 the Prest-O-Lite Company did not take any further steps, assuming that under section 367 of the business law its trademark and the use of the tanks made by it for Prest-O-Lite gas exclusively were protected by the following passage of that section:

"Any person or corporation that has heretofore filed in the offices mentioned in sections 360 or 361 a description of the name or names, marks or devices upon his or its property, therein mentioned, and has caused the same to be published according to the law existing at the time of such filing and publication, shall not be required to again file and publish such descriptions to be entitled to the benefit of this article."

The regulations referred to in this section deal with the registration of trademarks only for such products as soda and mineral waters, porter, beer and other beverages, without mentioning in any clear way such compounds as the solution of acetylene gas in acetone.

During November last the Prest-O-Lite Company filed an application for registration of its tradename and trademark under the new law.

The Prest-O-Lite Company was represented in court by Winter & Winter, while Lewis F. and Jacob Lande represented the defendant.

The Prest-O-Lite Company has filed four more cases which will come up in the Municipal Court of New York before Judge Spiegelberg on February 14, the defendants being Smith-Haines; Richards Auto Supply Company; Economical Tire & Supply Company; Brickner's Auto Garage, all of New York City.

Colorado Road Boosters to Meet

COLORADO SPRINGS, COL., Feb. 1—The second annual convention of the Lincoln Highway Association of Colorado will be held at Colorado Springs on Wednesday, February 12. The official call for the meeting has been issued by President Leonard E. Curtis and Secretary-Treasurer A. W. Henderson.

The counties holding membership in the association are: Kit Carson, Lincoln, Elbert, El Paso, Teller, Park, Chaffee, Lake, Eagle, Pitkin, Garfield and Mesa, and delegates may be appointed by mayors, county commissioners, commercial, good roads, automobile, agricultural and stock growers' associations, as well as by editors and proprietors of newspapers.

Plans for the next year's work, the election of officers and the reports of the first year's accomplishments will be taken up at the meeting, and in view of the fact that it comes on Lincoln's birthday, special ceremonies appropriate to the day will be arranged.

The recent annual convention of the association, held in Denver, occupied itself with discussion and action on the problem of legislation which will make available for use on the roads of the state the internal improvement fund, which now amounts to about $750,000. The convention recommended to the Legislature the adoption of a bill creating a highway commission with an advisory board composed of the governor and representatives of various sections of the state, and placing in the hands of this commission the internal improvement fund.

DENVER, COL., Jan. 31—If Colorado will build a good automobile road across the state to the Utah line, along the route of the Midland trail as recently marked out by A. L. Westgard of the American Automobile Association, Salt Lake City will provide a fund of $1,500,000 to carry the highway across Utah. This challenging proposition has just been made to the motorists and other good roads promoters of Colorado by President B. F. Redman of the Salt Lake City Automobile Club, who has been visiting in Denver.

DENVER, COL., Jan. 30—Two measures of vital interest to motorists have been introduced in the Colorado Legislature by Senator Tobin. The first provides for the appropriation and use of funds for building and maintaining a system of good roads throughout the state, and the second provides for the state registration of motor vehicles and the licensing of operators and all drivers.

Proposed Ohio Speed Law Radical

TOLEDO, O., Feb. 1—Heavy fine and long imprisonment will face automobile speeders if a bill drawn by City Solicitor Schrieber and which he will have introduced in the Legislature becomes a law. A fine of not more than $500 or not more than 6 months in the workhouse is provided for the first offense. A fine of $500 and 6 months' imprisonment is the penalty for any subsequent offense. The owner or master who knowingly consents to high speed is made equally culpable with the driver. The new law would make the owner and operator of any motor vehicle violating the provisions of the act jointly liable in damages for any injuries inflicted. The fact of excessive speed would be prima facie evidence of negligence and would throw the burden of defense on the owner and operator of the car. The bill provides that where anyone is struck by a motor vehicle the offense shall be construed as assaut and battery unless the injuries warrant a more serious charge.

No More Roads for Hardin County

TOLEDO, O., Feb. 1—According to a decision handed down by the Court of Appeals in the case of William Gibson, a farmer, against the Hardin County Auditor and others, all pikes which have been built in this county for the past 30 years have been illegally constructed. The decision has stopped $70,000 worth of road work now under way in that county.

Marylanders to Pay D. C. Fees

WASHINGTON, D. C., Feb. 1—Beginning February 16 the district authorities will begin a strict enforcement of the new regulation imposing upon motor car owners of Maryland the same license fees as are assessed Washington motorists by

Maryland. The law is now in effect but no penalty can be enforced until February 15.

Residents of Maryland who live just over the boundary line between the District of Columbia and that state, but are engaged in business in Washington and pay taxes here, claim that the hardship of the new law will fall principally upon them. Through a committee they have asked the district officials to make an exception in their case but the commissioners, while realizing the hardships that will be imposed in individual cases, point out that the best remedy for them is to obtain an amendment to the Maryland motor car law providing for reciprocal relations between the District and Maryland.

Texas Road to Be Rebuilt

AUSTIN, TEX., Feb. 1—Steps have been taken to rehabilitate what is known as the King's Highway which runs from San Antonio to Nacogdoches, Tex., a distance of 300 miles. At a meeting just held in Austin of a number of men who are interested in this movement preliminary arrangements were made for effecting a permanent organization to carry on the restoration work. Among those attending this meeting were J. W. Young, mayor; J. C. Miller, L. A. Daniel, John Legory, all of Crockett, Tex.; J. C. Hesslit, of Caldwell; Paul D. Page, of Bastrop; J. W. Warren and D. E. Colp, of San Antonio. George D. Marshall, federal highway engineer, who is also president of the State Good Roads Association, attended the meeting. It was decided at this meeting to log the highway throughout its length. The loggers are to be accompanied by Prof. R. J. Potts of the State Agricultural and Mechanical College, and Mr. Marshall. It is estimated that the road can be rehabilitated and placed in first-class condition for approximately $2,500 a mile.

Onondaga May Use Convicts

SYRACUSE, N. Y., Feb. 3—Dr. Sargent F. Snow, chairman of the highway committee of the Automobile Club of Syracuse, today presented before the Board of Supervisors of Onondaga County the advantages of employing convict labor in the county construction of state highways, following the progressive ideas advanced by County Superintendent Frank E. Bogardus. The recommendation follows some experiments in employing convicts from the penitentiary at Jamesville in road building in that vicinity.

As the result of numerous complaints by members of the Automobile Club of Syracuse against construction and maintenance of highways in Onondaga County the club has decided to appoint a grievance committee of three members to investigate the complaints. It is claimed much of the contractors' work on new stretches of state road is extremely poor.

Gov. Baldwin Against MacDonald

HARTFORD, CONN., Feb. 3—Governon Simeon E. Baldwin desires the removal from office of Connecticut State Highway Commissioner James H. MacDonald. He filed this week with Attorney-General John H. Light charges alleging incompetence. The charges will be formulated by the attorney general and service will be made on the commissioner, who must appear before a judge of the Superior Court. Just who that judge will be is at present a matter of speculation. Governor Baldwin has filed twenty-one specific charges against the commissioner and these, it is said, cover the commissioner's entire term of office.

The Governor has been opposed to the commissioner ever since he assumed office two years back. He endeavored to have him ousted. MacDonald remained. The Governor has named William H. Cadwell, of New Britain, as Highway Commissioner. MacDonald's term of office expired July 1, 1911, but the commissioner held over under the provision of the law that he should remain in office until his successor was duly appointed. He has not yet been appointed.

Hartford Writ Is Denied

Republic Rubber Company Re-elects Old Officers at End of Fiscal Year—Closes Successful Season

American Tire and Rubber Increases Its Capitalization—Dorian Remountable Rim Company Sold at Auction

HARTFORD, CONN., Feb. 3—The United States Supreme Court denied a writ of certiorari filed by the Hartford Rubber Works in which the second circuit upholding the validity of the Adams' patent be set aside and a new trial ordered. The Hartford Rubber Works took this step in patent litigation to attack the validity of the patent granted to Adams and controlled by the Metallic Rubber Tire Company which, it is claimed, was infringed by the Hartford Midgeley tread tires. The Connecticut District Court had decided in favor of the Hartford Rubber Works, while the Circuit Court reversed the decision. The refusal of the United States Supreme Court to issue the writ of certiorari signifies the final closing of the litigation.

Republic Rubber Had Banner Year

YOUNGSTOWN, O., Feb. 3—At the annual meeting of the Republic Tire & Rubber Company recently at Youngstown, O., all the old officers and directors were re-elected. The year 1912 was a banner one and a number of improvements were made, including a new shop, which greatly increases the capacity of the plant.

The officers and directors chosen follow: President, T. L. Robinson; first vice-president and sales manager, J. H. Kelly; second vice-president, L. T. Peterson; secretary, C. F. Garrison; treasurer, M. I. Arms; general superintendent, A. H. Harris; directors, John and David Tod, J. C. Wick, H. K. Wick, M. I. Arms, C. H. Booth, Robert Bentley, J. H. Kelley, A. H. Harris, L. T. Peterson and T. L. Robinson.

American Tire and Rubber Capital Increased

AKRON, O., Feb. 3—The annual stockholders' meeting of the American Tire & Rubber Company, of Akron, O., was held recently when the following directors were elected: Adam Duncan, Charles F. Fosnight, F. L. Kryder, F. M. Lapp, Frank Pfeiffer, James Shaw, Gus Seiberling, C. M. Wertz and G. C. Waltz. Adam Duncan was elected president, G. C. Waltz vice-president, Frank Pfeiffer treasurer, and F. E. Rowe secretary and assistant treasurer.

The stockholders authorized the board of directors to increase the capital stock from $200,000 to $500,000, of which but $50,000 will be issued at this time. The company is waiting for final patent papers before following their intention of placing a solid tire upon the market.

Dorian Property Sold at Auction

The Dorian Remountable Rim Company, New York City, which went into the hands of the receivers some time ago, is not to be reorganized, according to Olcott, Gruber, Bonyinge & MacManus, who ordered the receiver's sale. The company's property, consisting of rims, nuts, bolts and similar paraphernalia, was disposed of at three sales, the last of which was held on February 3. The amounts received at these were $6,100 at the first, $3,447 at the second and $70 at the final sale, making a total of $9,617 realized from the proceedings.

Champion Plug Features In Patent Litigation

Thirty-Five Per Cent. Automobile Company Sued by Bernard Morgan Who Claims Infringement of His Patent

Plug in Question is of the So-Called Priming Type with Threaded Inclined Passageway Containing Priming Cup

THE Thirty-five Per Cent. Automobile Company, New York has been sued by Bernard Morgan, of Newport, R. I., the latter claiming infringement of his patent on priming cocks by the act of the defendant selling Champion plugs, made by the Champion Spark Plug Company, Toledo, Ohio. The Champion plug in question is of the so-called priming type, consisting of a plug, the shell of which is threaded with an inclined passageway, into which fits a priming cup, screwing into the bored portion of the plug. When the cup member is screwed tight into the thread in the plug, a needle formed on the end of the cup member makes a tight fit against the plug shell, keeping gases from leaking out through the passage.

The principal point of the complainants patent No. 982,009, filed March 1, 1910 and granted January 17, 1911, lies in the following claims:

A test or priming cock, comprising a cylinder plug having a seat, and a closing plug screwing in the said cylinder plug and adapted to be seated on the said seat to close the cylinder plug, one of the plugs having a reservoir for the explosive fluid, and an outlet port leading from the bottom of the reservoir to discharge the fluid into the cylinder plug on unseating the said closing plug.

Munn & Munn, New York City, represent the plaintiff.

Hitchcock Takes Bids for Trucks

WASHINGTON, D. C., Feb. 1—the most important purchase of motor cars ever made by the United Sates Government is about to be consummated. Postmaster General Hitchcock today opened bids for furnishing as they may be ordered during the fiscal year ending June 30, 1913, approximately 100 motor vehicles, suitable for the rapid delivery of parcels in cities. It is expected the contract will be awarded within the next 30 days.

Tom Hay with Staver Carriage

CHICAGO, ILL., Feb. 1—Tom Hay has taken over the Staver line for northern Illinois, eastern Iowa, all of Indiana and southern Michigan. For years Tom Hay has been one of the most talked about men in the automobile business. He holds a record, perhaps unequaled, of the sale of from 15,000 to 16,000 cars in a territory practically parallel to the one he will handle for the Staver Carriage Company. Mr. Hay will make his headquarters, as well as the retail selling headquarters for Staver automobiles, at 1725 Michigan avenue.

Willys Buys Hexter Company

T. K. Hexter, formerly connected with the Hexter Motor Truck Company, New York City, which has handled the Gramm line of trucks for years in the Metropolitan district, has resigned his position with the company, having sold his entire interest in the concern to John North Willys. It is being rumored that the Overland company will transform the Hexter concern into a service department of the manufacturing corporation, further details being held back at present until all details are settled.

Mr Hexter, while refraining from announcing his plans in detail, is intending to manufacture a new make of freight automobile operating on principles original in motor truck manufacture. The name of the company which he will found in the near future has not been decided upon, but the enterprise will probably bear his name as soon as a certain period has elapsed, as Mr. Hexter's arrangement with the Overland interest prevents him from making use of his name in the truck manufacturing business within the next six months.

The present Overland service department is located at the Silver sales agency which handles all the Overland cars, both pleasure and commercial at present. Whether the new plant will supplant the Silver agency or not has not been stated at present.

London Taxis May Decrease

LONDON, Jan. 25—The police have not been slow to make note, during the present strike, of the difference in the regulation of the traffic with some 9,000 taxicabs off the streets, and it is quite probable that when the trouble is finished with that something new will be awaiting the drivers in the form of a limitation of the numbers of motor cabs allowed on the streets. It is in the congestion that the danger of accidents arise, and the motor-omnibuses, which are easily discernible, have proved to be of no such danger as was generally supposed. The public have also noticed the difference of the condition of traffic, and now darts across the roads hurriedly as it is quite capable of avoiding danger now that the taxicabs, that dodge in and out of the traffic, and sometimes appearing from "nowhere," are idly locked in the garages. In this way what little inconvenience there has been in hailing a motor-cab has been amply made up for.

Market Changes for the Week

There was considerable activity in tin in the local market yesterday, following the break in prices on the previous day to $49.25 per 100 pounds, a decline of $.90. Copper showed no improvement in demand from either domestic or foreign consumers, and the tone of the market was weaker, with a sympathetic decline of $.00 1-8 and $.00 1-4 in electrolytic and lake. Oil Petroleum, Pa., still continued to climb with predictions of higher prices. After resting a few days the advance of $2.47 per barrel came yesterday bringing it $.03 of the goal for which oil producers have long sought, $2.05. Cottonseed oil remained firm, due to a little more active trading conditions, following a general demand, colsing at $6.31 a barrel at an advance of $.03.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb...	.08¼	.08¼	.08¼	.08¼	.08¼	.08¼	.....
Beams & Channels, per 100 lb.....	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	28.50	28.50	28.50	28.50	28.50	28.50	.....
Copper Elec., lb...	.16⅛	.16⅛	.16	.16	.16	.16	—.00⅛
Copper Lake, lb...	.16⅜	.16⅜	.16⅜	.16⅜	.16⅛	.16⅛	—.00¼
Cottonseed Oil, Feb., bbl.....	6.28	6.28	6.28	6.24	6.27	6.31	+.03
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden Brown	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gal.....	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime...	.90	.90	.90	.90	.90	.90	.....
Lard, 100 lb.....	4.30	4.30	4.30	4.30	4.30	4.30	.....
Linseed Oil.....	.49	.49	.49	.49	.49	.49	.....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	.....
Petroleum, bbl., Kansas crude...	.88	.88	.88	.88	.88	.88	.....
Petroleum, bbl., Pa. crude	2.33	2.33	2.40	2.40	2.40	2.47	+.14
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, Raw Italy...	....	4.35	....	....	4.35	....	.....
Silk, Raw Japan..	....	3.72½	....	....	3.72½	....	.....
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.....	50.15	50.12½	50.20	50.10	49.50	49.25	—.90
Tire Scrap.....	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.....

Zenith Brings Suit Against Stromberg

Refutes Stromberg's Ahara and Richard Patent Basic Claims on Plain Tube Carbureters

Counter Action Alleges Infringement of Francois Bavery Patent Assigned to French Zenith Company

DETROIT, Feb. 3—The Zenith Carbureter Co. of this city has begun suit in the Federal courts here against the Stromberg Motor Devices Co., Chicago, maker of the Stromberg carbureter, for infringement of the Baverey patent, No. 907,953, under which patent the Zenith company is building its present type of Zenith carbureter. This suit is of unusual interest in that on December 24, 1912, the Stromberg Motor Devices Co. filed suit in the Federal court of this city against the Zenith company asking that an injunction be granted prohibiting the Zenith company from making the Zenith carbureter on the ground that it was an infringement of two patents owned by the Stromberg company, namely, the Ahara patent, No. 684,662, and the Richard patent, No. 791,501.

The situation is perhaps one of the most unusual on record to date in that both Stromberg and Zenith companies consider that they control respectively basic patents covering a type of carbureter without moving parts and operating upon a principle of atmospheric control in which two nozzles are used, one a conventional nozzle fed direct from the float chamber, as in the standard type of carbureter today, and the other a compensating supply nozzle. Apparently each concern has every confidence in its patents and it will be up to the courts to decide which really owns the basic one. The Zenith company has been manufacturing its carbureter for some time and the Stromberg concern has been exhibiting at the shows its model E, which it believes to be in accordance with the Ahara and Richard's patents.

In order that the respective merits of the patents may be understood, the following digest of each sets forth the features.

F. Baverey secured his patent, No. 907,953, December 29, 1908. The object aimed at in this patent is outlined as follows: "With ordinary spray carbureters the proportion of fuel in the mixture increases with the speed of the motor, the passage of fuel (gasoline) through the orifice heading into the suction conduit being not uniformly proportional to the quantity of air sucked into the conduit, but increasing on its acceleration of the motor at a higher rate than the quantity of air owing to the higher degree of vacuum produced at high speeds. The purpose of the present invention is to remove this disadvantage and to render the proportions of the mixture constant at all speeds of the motor * * * there is used a supply nozzle for gasoline, the feed of which increases too rapidly with increasing motor speed, and in conjunction a compensating supply nozzle, the flow of gasoline through which increases either at a lower than a normal rate or preferably not at all. These nozzles can be so regulated that the aggregate amount of fuel passing through them increases in the same proportion as the quantity of air sucked in, so that the richness of the mixture remains constant.

In construction there are two nozzles side by side in the venturi mixing chamber. One communicates direct with the gasoline in the float chamber. The other communicates with a vertical standpipe at the side of the float chamber and into this standpipe gasoline flows through a regulated valve, so that the flow through this valve is constant for any setting of it. The standpipe is of larger diameter than the nozzle and gasoline collects in it so that when starting the motor there is a surplus supply of fuel available, but as soon as the fuel in the standpipe is exhausted, which happens with higher motor speeds, then the supply is fixed so that bubbles of air pass through the compensating nozzle instead of gasoline. By this compensating arrangement it is claimed to obtain a mixture weaker in gasoline as the engine speed increases.

G. V. Ahara obtained his patent, No. 684,662, October 15, 1901, and it was acquired during the past fall by the Stromberg company. The object aimed at in the patent is set forth as follows: "The purpose of this invention is to avoid varying the mixture of fuel and air by providing for an excess of fuel in relation to the quantity of air for the first explosions occuring after a cut-out to compensate for the greater quantity of air at present in the cylinder. * * * Also, to provide means by which the quantity of fuel to be drawn into the cylinder after a cut-out may be varied, depending upon the length of the time during which the suction, or feed of fuel to the engine, is omitted or cut-out."

In construction the Ahara patent has two nozzles located side by side in the same mixing chamber. The main nozzle feeds direct from a fuel chamber having a controlling cone-type regulating valve in the passage between the float chamber and the nozzle. The compensating nozzle is supplied from the main nozzle and has a collector tube, the upper end of which is open to the atmosphere. This collector tube fills from the main nozzle and affords a ready volume of gasoline for starting purposes, irrespective of the regulation of the cone valve which controls the flow between the float chamber and the two nozzles.

F. Baverey claims as follows: Fig. 4. In a carbureter the combination of a suction control fuel gap with an additional fuel feed regulated to give a constant supply per unit of time, the two jets being relatively proportioned so that their combined supply is proportional to the air supply.

1—In a carbureter the combination of a suction controlled fuel feed jet with an additional fuel feed regulated to give a constant supply per unit of time.

G. V. Ahara claims in his patent:

1—A feeder for explosive engines comprising a fuel reservoir having a feed outlet below the fuel level therein, to affect a continuous feed. a passage communicating with the atmosphere and with said outlet from said reservoir to receive fuel therefrom, and means adapted to control the communication between said reservoir and said passage.

7—In a feeder for explosive engines, a casing having a fuel reservoir therein provided with a continuously-open gravity-feed outlet in its lower portion, and a passage having a portion communicating with the atmosphere and with said reservoir-outlet, whereby fuel is adapted to collect by gravity in said passage.

Automobile Securities Quotations

The stock market during this week showed a general strength, in response to the healthy condition of the industry which expressed itself by a number of dividends declared during the past month. Notable advances were made by several issues, especially rubber stocks, Goodyear common rising 15 points, and Miller 35. Garford preferred also displayed great strength and advanced 5 points over last week's closing figure, on account of rumors of changes in management.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	165	185
Ajax-Grieb Rubber Co., pfd	..	..	95	100
Aluminum Castings Co., pfd	..	..	98	100
American Locomotive, com	33	33½	40	40½
American Locomotive, pfd	103	103½	104	105½
Chalmers Motor Company	..	..	135	145
Consolidated Rubber Tire Co., com	8	12	20	23
Consolidated Rubber Tire Co., pfd	15	30	70	80
Firestone Tire & Rubber Co., com	200	204	355	360
Firestone Tire & Rubber Co., pfd	108	110	106½	107½
Garford Company, preferred	..	..	105	107
General Motors Company, com	34½	36	34¼	34¾
General Motors Company, pfd	74½	76	78	79
B. F. Goodrich Company, com	..	..	62½	63½
B. F. Goodrich Company, pfd	..	..	103¾	104¼
Goodyear Tire & Rubber Co., com	330	335	460	470
Goodyear Tire & Rubber Co., pfd	104	106½	104½	105½
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	5	15
International Motor Co., pfd	..	..	25	50
Lozier Motor Company	..	..	..	32
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	104	107	103	105
Peerless Motor Company	..	..	120	125
Pope Manufacturing Co., com	38	41	30	32
Pope Manufacturing Co., pfd	68	70	77½	79½
Reo Motor Truck Company	8	10	11½	12¼
Reo Motor Car Company	23	25	20½	21¼
Studebaker Company, common	..	..	34	35
Studebaker Company, preferred	..	..	92	93
Swinehart Tire Company	..	..	110	112
Rubber Goods Mfg. Company, pfd	100	105	105	107
U. S. Motor Company, com	..	..	..	10
U. S. Motor Company, 1st pfd	..	..	..	35
U. S. Motor Company, 2nd pfd	..	..	..	75
White Company, preferred	..	..	105	108
Willys-Overland Company, com	..	..	70	70½
Willys-Overland Company, pfd	..	..	98	99½

January Record for Incorporations

The month of January, 1913, was a record period for incorporations, the capitalization for the new charters taken out in the states of Delaware, Pennsylvania, New Jersey, New York, Rhode Island, Massachusetts and Maine totalling $749,927,500, as compared with $452,400,000 in December, 1912, and $541,399,000 in January, 1912. The increase for the past month over December last is therefore 66 per cent., and over January, 1912, 20 per cent. The total automobile incorporations and their relation to the total charters of the several states stands as follows:

State	Total Incorporations	Automobile Incorporations	Per Cent.
Delaware	$94,595,000	$37,450,000	39.4
New Jersey	100,560,000	1,300,000	1.29
New York	77,492,500	3,600,000	4.65
Massachusetts	39,105,000	27,500,000	70.5
Maine	57,800,000	3,000,000	5.7
Miscellaneous	29,000,000	2,500,000	8.65
Average per cent., $21.69.			

The average total percentage of automobile charters in the states considered is 21.69, or more than one-fifth.

Digest of the Leading Foreign Journals

Value of Recuperating Gas Ovens for Forging and Heat-Treatment Greatly Advanced by Modified Construction—Principle of Mixing Air with the Fuel in the Jet Illustrated in New Carbureter—How the Germans Build for 1913

Recent Improvement in Gas Furnaces.—Complete combustion accomplished with a minimum of air is the first condition for fuel economy in a furnace. This is one of the reasons why coal or coke furnaces, in which the great surplus of air needed for the combustion of the solid fuel carries a very large percentage of the heat away with it through the flues, have given way to gas or oil furnaces in most well-organized metal-working establishments. In the case of gas furnaces, either the coal is first turned into gas in a generator furnace or gas from an independent source is used, but under both conditions the exhaust gases of the furnace are utilized for pre-heating the air, and frequently also the gas, before it is admitted. As, furthermore, the amount of air may be regulated to a nicety and can be held down to just what is required for burning the gas, the economy is decisive, while the distribution of the heat or its concentration, if desired, can also be accomplished with great facility.

According to the nature of the pre-heating system such furnaces or ovens are classified as (1) regenerative, if the direction of the flame and the draft alternates, and (2) recuperative, if the flame does not change direction and either the air or both the gas and the air is pre-heated in socalled recuperators. The regenerative system is mainly used for very high temperatures which are not usually required for the heat-treatment or forging of metals. Its installation is relatively expensive, and unremitting attention is called for in the operation of its alternating-mechanism.

The recuperative system is inexpensive in the first place and automatic in the general features of its operation, but the recuperators used with it have been deficient in some respects. They were usually built in the form of flues for exhaust gas and for air in alternating layers separated by fireproof partitions or cast-iron plates, the gases traveling from the furnace downward—imparting their heat to the partition walls, and the air rising from below and receiving heat from the opposite sides of the same walls. The trouble experienced with this construction was that the partitions were liable to leak at the joints and the resulting mixing of the exhaust gas and the air currents led to considerable irregularities in the draft and the heat generation. Moreover, repairs could not be made while the furnace was in operation and involved considerable work.

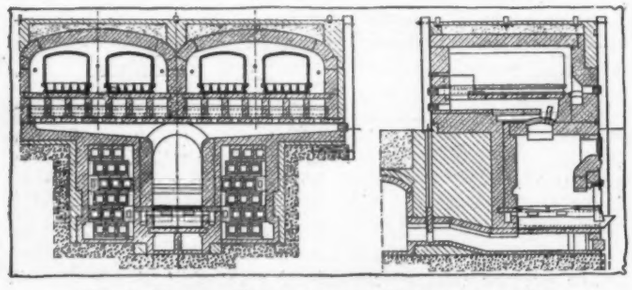

Fig. 1—Recuperating gas ovens, Hermansen system

Important progress in this respect is now effected by building recuperators according to the Hermansen patent. The novelty of the construction lies mainly in the form of the bricks used in building them. They are hollow fireclay bricks with transverse grooves on the upper and lower surfaces. The square hollow spaces in the bricks form the exhaust gas channels, while the grooves come together with corresponding grooves in bricks above and below to form the air channels. The ends of each brick are tenoned to engage the adjoining one, and the bricks are so laid that the gases follow a zig-zag course from top to bottom and longitudinally of the furnace, while the air rises from one layer of transverse channels to the next higher one. To this end, the bricks of each layer are offset transversely one-half brick with relation to the layers above and below, so that riser-spaces one-half brick wide are created alternately to the left and right of the structure between the recuperator tubes and the furnace walls. As the joints of the bricks are also staggered longitudinally, all mingling of air and gas is excluded.

Another important advantage attained by this construction lies in the easy access to the flues for purposes of inspection and cleaning. The front wall and, if the generator gas is pre-heated, also the side walls of the recuperator are built of similar precisely-shaped bricks, so that there is an end-opening for each flue, and this is closed with a fireclay stopper which is perforated and provided with a window.

As a recuperator of this design demands but very little room, the oven, the generator and the recuperator can readily be built as one unit, and the open or muffle ovens used with this equipment need not differ in arrangement from those usually employed with direct coal or coke firing or with mixed direct and gas firing.

The author, Engineer L. Kentnowski, describes and illustrates a number of installations in which the Hermansen design is incorporated and in all of which the gas generator is built into the plant below the service floor from which the ovens are operated. One of these plants, built for the *Deutsche Waffen und Munitions Fabriken* at Karlsruhe, for the heating of ammunition material, is shown in transverse and longitudinal sections in Fig. 1. It comprises 4 ovens with 16 cast-iron retorts, and each of the ovens is served with fuel gas from a separate generator.

If the gas is taken from public conduits or an isolated generator, as usual in the iron and steel industry, two independent recuperators are built under the ovens, one to pre-heat the air and the other the gas.—From *Metall und Erz*, January 8.

From Carbureter to Vaporizer—What is the use of having large inlet valves in a motor for the sake of getting the benefit of its full range of power if there is a throttling action in the Venturi tube or the air admission of the carbureter? Some such question, as well as the relatively new idea in carbureter design of leading air into the jet itself at the high motor speeds for the purpose of reducing the proportion of fuel in the mixture, and atomizing the fuel at the same time, seems to have

actuated the makers of the Gobbi carbureter, a newcomer in an apparently crowded field. The features first noted in the construction, are a jet with concentric channels four to five times as large as the conduits in ordinary jets, a mantle coming down over the outer annular channel and, in the float chamber, the absence of the customary weights and levers to regulate the admission of the fuel. The dimensions of the jet are in reality considerably larger than the drawing, Fig. 2, shows. Continued inspection brings it to one's attention that the mouth 2 of the jet is unusually close to the throttle valve, whose under-surface, by the way, is of a special formation determined by experiments, and that the outer annular channel is not really a channel at all, so as to constitute a second jet communicating directly with the gasoline supply from the float chamber, but is merely a sort of elongated cup receiving overflow from the central jet through the perforations 3 and 4 and communicating with the atmosphere under the mantle P. The level of gasoline before the starting of the motor is of course identical with the float level in the cup as well as in the jet.

When the start is made, the suction draws air from around the mantle P and gasoline from the mouth 2 together with some air bubbles through perforation 4. These bubbles help to vaporize the first charges. If the motor is allowed to speed up, the increasing suction in the jet soon exhausts the gasoline supply in the cup, because the atmospheric depression is communicated through the perforations 3 and 4 and air is sucked in under the mantle. That the mantle acts in this manner is a matter of experimental demonstration. The more rapid the suction from the motor, the more air finds its way not only around the mantle but also under it and into the cup, and at a certain motor speed it begins to penetrate at perforation 3 and to mingle with the ascending column of gasoline in the jet, holding the flow of the fuel down to the proper proportionality of 1 to 18 weight parts of gasoline and air respectively. [While 1 to 9 weight parts is the proportion theoretically required for perfect combustion, 1 to 18 is the proportion found most suitable in actual motor practice at high speed—tending toward 1 to 16 at low speeds—owing to the short time available for effecting a completely gasified mixture and to the amount of oxygen needed for the unavoidable combustion of lubricating oil. The possible effects of special lubricating systems, such as admixture of graphite with the oil, to modify the desirable proportions between fuel and air, have not, so far as known, been ascertained.—Ed.]

The construction thus involves no other variation of the air channels than that which is caused by the operation of the butterfly throttle valve. The position of the latter alone determines whether the charges drawn into the cylinders at a given motor speed shall be small or large, in proportion to the load of the vehicle, the same as with other carbureters, while the vaporizing jet alone takes care of the mixture by causing more or less air to be mixed with the ascending column of gasoline, according to the speed of the motor. It is not stated how this construction is adapted to different types and sizes of motors.

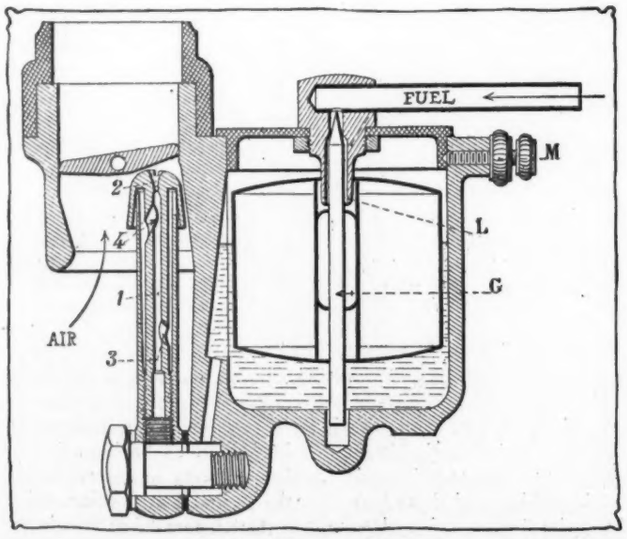

Fig. 2—Gobbi carbureter, atomizing the fuel in the jet

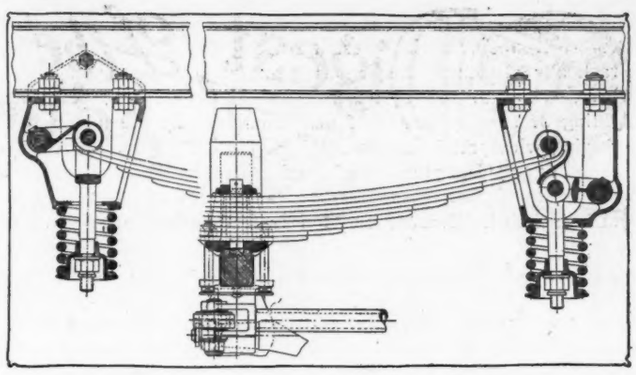

Fig. 3—Front spring construction in the Büssing heavy truck

In the mechanical construction it is noted that the needle valve G is fitted tightly in the axis of the float, so that the level can be changed by pushing it up or down, and that the tube L, in which the gasoline arrives by top feed, is extended so as to telescope into the bore of the float and is supposed to regulate the feed as effectively as this may be done by the leverage system generally employed, while also guarding especially against the tendency to overfeeding to which the top-feed system is said to be liable.—From *La Vie Automobile*, January 18.

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NOTES from the German Industry—From a review of the automobile situation in Germany with reference to construction and commerce it is noticed that the universal aim is mass-manufacture by the most economical methods but that the home market is scarcely sufficiently large to permit the realization of the intention. The popular demand runs now mostly to cars of less than 10 horsepowers, as the taxation becomes considerably higher when this power is exceeded and the speed regulations in the cities render higher power useless under most circumstances. The formula applied for determining the tax gives a low rating, however. Every manufacturer has given special attention to this type of car in his schedule of production for 1913, and most of the new models are designed in the semblance of the larger cars whose vogue is passing—though they are still preferred by all who can indulge in grand touring—and, while smaller and lighter, are equipped in the same style, mechanically and otherwise.

For light trucks, delivery wagons and omnibuses the chassis are usually the same that are used for pleasure cars of the same power, this being the result of attempting series-manufacture for a limited market.

The production of heavy trucks, on the other hand, is assuming large dimensions, by reason of the state-subsidy system. Nearly 20 manufacturers are turning out this class of vehicles, practically all of them conforming to the rules for loads and dimensions which have been laid down by the army authorities as conditioning the payment of the subsidy. The new rules call for a lighter type than was formerly specified, and the trials made with the new vehicles last October have justified the change, which was occasioned by road difficulties arising from heavy loads.

While the great majority of three-wheeled vehicles are used for merchandise delivery, an increasing number of the three-wheel chassis are now fitted with open or even closed carriage bodies with more than two seats and are finding favor for use in the cities.

In the general industry the enhancement of motor efficiency

and silence is the principal achievement of the past year, the sleeve-valve motor having exerted a strong influence to this effect. Practically all other conspicuous changes, in Germany as elsewhere, relate to the equipment. Motor starters and electric lighting of cars by means of generators run by the motor are engaging widespread attention.

The 1913 models give evidence of great care in the improvement of the spring suspension for all classes of vehicles, the trucks included. Broader and longer leaf springs are the rule as compared with 1912. Shock-absorbers are widely adopted in a profusion of varieties. Platform springs are no longer uncommon, and here and there semi-elliptic springs are used in pairs, side by side (which gives more freedom for torsion than a single broader spring). The rear springs are in some instances adapted to transmit the traction thrust.

The grouping of all valves on the same side of the motor has become universal, partly by reason of the cheaper manufacture and the reduction of parts secured by this design. The carbureter is nearly always located on the opposite side from the valves and is secured to a simple flange on the monoblock motor casting, the induction pipe being cast into this between the two middle cylinders and terminating in an enlarged chamber from which short conduits lead to the inlet valves. The exhaust pipe, on the other hand, is never cast in the block or inclosed, as experiments in this direction showed very unfavorable results in the way of keeping cylinders hot on one side and causing strong local tensions in the materials.

All the different arrangements of the valves—poppet valves—are represented in the 1913 models, each firm holding on to the style once adopted, more for the sake of preserving the individuality of its product than for strong technical reasons.

The tendency to a long stroke is pronounced and an offset crankshaft is not uncommon. Valves and, in so far as possible, all other moving motor parts are as a rule boxed in to secure silence as well as protection from dust. Cooling by the thermosiphon system has gained several new adherents, even for large touring cars, the monoblock castings giving an opportunity for the large pipe sections required with this system, while the saving of the pump and the automatic adaptation of the system to varying outside temperatures are appreciated features. The motor lubrication is now in nearly all instances automatic, so that little more is required of the car owner than to keep the reservoir filled.

The suspension of the motor in the frame is now usually effected without the use of a false frame, and it is in act the general tendency to compose the frame of as few parts as possible. As a rule the front portion of the main frame is narrowed so that it can be reached on both sides by the brackets of the crankcasing. Only in a few instances is the upper half of the crankcasing extended bodily to the frame, though this construction affords great convenience for the mounting of magneto, water pump and lighting dynamo as well as for adjustments and repairs, doing away with all chance for having tools dropped into a drip pan through dispensing entirely with the pan itself. In contradistinction to this rigid suspension, three-point suspension is numerously represented, for the gear box as well as for the motor. In heavy trucks the false frame is still used, but it is suspended from the main frame by very substantial lubricated joints.

The cone clutch is more than holding its own against the multiple disk clutch. The Hele-Shaw clutch is seldom seen in the German cars. The cone clutch is, however, considerably improved. Its inertia is reduced by using sheet steel for its manufacture or by using two oppositely inclined cones of reduced diameter and in which of course all end-thrusts are absorbed. Special small brakes to take up the rotary inertia of the clutch and gears have been taken up again, after a rest of a few years, but they still do not seem to work to entire satisfaction.

The unit construction, by which motor, clutch and gear box are built into one casing, is making very slow progress, though it has been employed successfully for several years by one of the leading German manufacturers.

Hydraulic transmissions are still in the embryonic stage. Their weight and the chance of leakage at th ebearings is against them, and it is understood that they do not respond well when unusual demands are made upon the power. Their low cost does not yet, in the general opinion, compensate for these disadvantages. [Only one type of hydraulic transmission is in operation in German cars.—ED.]

Though silence is sought, silent chains are not meeting with much favor, mostly because their use involves additional cost of production and larger, and therefore heavier, casings than are required for gears. Great efforts, on the other hand, are made to render gears silent by painstaking milling of the teeth.

Horizontal division of the gear box is being avoided more and more. A casing cast in one piece with a large top-opening is preferred, giving lighter construction with fewer bolts and nuts, and offers no difficulties to the assembling of the gears. This is especially the case now, since ball bearings are becoming universally used in the gear box and necessitate large end-openings in the casings. The really oil-tight gear box is, however, still an exception.—From *Allgemeine Automobil-Zeitung*, January 10 and 17.

The care given to spring suspensions, as referred to in the foregoing, is exemplified in the double front springs used for the heavy Büssing motor truck. The construction, which is shown plainly in Fig. 3, affords a progressive spring resistance and permits the front axle to work in practically straight up and down movements in such manner that the relation of the steering rod to the wheel is affected very little by road shocks; a provision which makes the steering easy and secure and reduces tire wear. The illustration is taken from *Der Motorwagen*, of January 10.

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Larger Middle Transverses.—Among the changes in the construction of frames, it is notable that the middle crossmember is everywhere increased in depth and robustness and is opened centrally to pass the transmission.

[It is also in some cases, for example in the Mercedes-Knight, developed as an elongated X, giving a much increased rigidity in the transverse plane midway between the wheel axles while localizing torsion of materials in the middle lognitudinal plane.—ED.]

The large transverse offers a rational support for thrust and torsion rods as well as far the attachment of the drip pan if one is used.—From show review in *Omnia*, January 4.

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Testing Aluminum Solder.—Among the many aluminum solders in the market there are several which disintegrate after a relatively short exposure to the weather. Otto Nicolai of Bonn, Germany, mentions a simple method for determining whether any given aluminum solder will prove durable or not. A sample of soldered work is placed under water, and, if within 48 hours small bubbles—which are hydrogen bubbles—appear either on the sample or upon the surface of the water, the solder will disintegrate in two weeks under water and in a few months by mere exposure to the atmosphere. Nicolai markets an aluminum solder himself, but the method is considered reliable. —From *Metall-Technik*, January 11.

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Voiding of French Patents.—With reference to the danger of having French patents forfeited in case patents on the same subject are forfeited in any other country (see THE AUTOMOBILE of January 9, page 162) it has been brought to notice that Germany and Austria-Hungary joined the Convention of December 14, 1900, at a later date and that therefore patents taken out by subjects of these two countries enjoy the same immunity from the danger referred to as patents taken out by Americans or other citizens of a country participating in the convention.—From a communication to *Le Génie Civil*, January 11.

The Engineers' Forum

Exhaust Gas Analysis

Engineers Discuss Value of Analyzing Exhaust Gases To Determine Engine and Carbureter Efficiency

E. R. Hewitt Favors Analysis and Gives Results of Years of Tests

Part I

Note—These discussions by leading engineers are from stenographic notes taken during the recent session of the Society of Automobile Engineers in New York City, when this pertinent subject proved one of the most interesting of the meeting.

NEW YORK CITY—I began work on exhaust analysis about 1898, I think, and I have been following it through pretty thoroughly ever since, and in addition to the ordinary work in the laboratory on test matters I had an exhaust gas apparatus rigged up, and when running my car I have been able to take samples under all the different conditions of road running using the ordinary Orsat apparatus. I hang it up with rubber, so it does not get too dirty in running the car, and have one man drive the car and the other man draws in a sample by drawing in five or six volumes of about 50 cubic centimeters each through the apparatus, then shutting off, so you get a good average sample, I should think, under the ordinary running of the motor. While drawing in 50 cubic centimeters you would probably have 100 or 200 cylinder explosions, so you get a good sample.

I noticed while driving merely at 20 miles an hour on the road the car would run 300 or 400 yards in drawing the 50 cubic centimeters, and in comparing these analyses in running I had very curious things develop. It was 2 or 3 years before I could understand what they meant. Now I have had to repeat those experiments on the road. The result was not the same as you would get if you had the motor set under load to produce 13 1-2 per cent. CO_2 and 1 to 2 CO and a trifle of free oxygen. You take it out on the road and you will not get those same conditions at all. I took a car and blocked it up on the back axle and put the brake against the rear brake drums and got the road conditions and made a note of the whole range and then took it out on the road without altering the carbureter and tested the thing up thoroughly **and the road conditions were not the same as the practical conditions in the shop. The reason for that seems to be that the jar of the motor affects the level in the carbureter considerably and that affects the mixture somewhat.** The difference in temperature inside the bonnet under different conditions affects the carburetion very much more than is generally understood. Carburetion is affected to the extent of about 15 per cent., as near as I can make it, by 100 degrees variation Fahrenheit. Now those variations occur every 100 degrees quite often, running over the road various times during the same ride. For instance, I ran with a thermometer in the radiator cap when I tried this experiment and got the temperature of the circulating water; and if the circulating water is, say, 120 to 130 degrees running on a level and you start to climb a steep hill, your circulating water will climb up to 160, 180 or even 200, and your exhaust gas analysis will change very materially without altering the carbureter at all. It will immediately become very much richer. It is leaner when it is cold and it is richer when it is hot, and it varies materially. **That is, if one were to give any opinion, your motor heats up when it climbs a hill and your temperature rises in your bonnet and the mixture becomes richer and you get a little more power.** You want a trace of CO in it, and I will explain to you in a moment why that is so; and you want a trace of free oxygen. You will evidently get in running on the road both free oxygen and CO, provided the CO does not exceed .5 per cent. In fact, you can have—under road conditions I frequently had as much as 1.5 and 2 per cent. CO and as much as 2 per cent. or 4 per cent. of free oxygen at the same time; and naturally I thought my apparatus was wrong and devoted a good deal of time to finding out where the trouble was. I spent the whole season fooling with that and could not discover where the trouble was.

The next season, when I got more time to spare with it, I went over it, and found there was no trouble with the apparatus whatever, and still continued to get free oxygen and free hydrogen at the same time. Then I tried some experiments in the shop, where we could observe the exhaust carefully, and I noticed by getting up close to the exhaust pipe and watching the engine when it was running slowly under very heavy loads, and putting a piece of colored glass so I could get right close to the exhaust flame, I noticed that where the flame came out over the port **you would notice a blue flame inside the valve, when you looked up inside. When it passed over the port you would notice it changed to yellow; and you would always notice a difference in color where the gas turned the corner around the valve.** That was noticed particularly where the mixture was imperfect, small globules remained in the air entering the engine.

Now what occurs is that you get your explosion in the cylinder; each individual globule of gasoline in the engine is burned up by the little molecules of oxygen around it as far as they can get at it. They burn off the outside shell of this thing and there is not time enough for them to burn that up. These other molecules of oxygen cannot get inside there and therefore they leave the core of gasoline in there, which is more or less broken up by the heat. The intense heat generated around this gasoline then practically mixes up all the free oxygen and hydrogen and when it explodes over the valve side all these things are stirred up tremendously with the high velocity over here, and then this core gets burned up by the excess of oxygen which is inside.

It first comes through the valve, it gets below the burning point outside the valve, and those things are carried out-

side through the valve and form free oxygen and free hydrogen and the other compounds. So when you get a very queer analysis like that you may make up your mind that the gasoline is entering in the form of globules and not in the mixture.

Now it can enter the engine in two ways. Suppose your mixture is either rich or badly mixed inside the carbureter. What occurs is this: the gas rises from the carbureter and is thrown against the outside wall of the intake pipe on the first curve, and after it is condensed against the wall of the intake pipe it falls right along it. Now if you have a four-cylinder engine and an intake pipe of that type you will invariably find that is the solution. But I am sure that the solution of that is because of the uneven mixture in these various solutions. Now if you tap off the explosion gases from these different solutions you will find a difference in the analysis of it. And this will not solve the queer analysis, it will not solve the normal analysis of more or less complete combustion; but they will vary very much. You can get tremendous variation between two solutions run on the same mixture, and it is entirely due to the centrifugal effect in the intake pipe. As you cannot get an intake pipe without curves you have got a complete mixture at the carbureter. The problem of getting that was one I worked on a good while. The first thing was to bring up hot air, and where you can get hot enough air you vaporize the thing. So I ran the air up to 1,150 degrees Fahrenheit, tying an electric heater to it to get it practically up to the combustion point of the gasoline. When I mix that hot air in the venturi tube, as the air exceeds 800 degrees Fahrenheit, I can get practically a complete mixture, so there would be no story of queer analysis, but the analysis would remain normal; but the amount of oxygen was so much increased by having that air at that temperature that you would have too much air in your intake pipe and it would spread materially and fill your cylinder full, because the friction would increase greatly, so you would cut down your maximum power very greatly. That made it impossible to work that system out, although I tried it and had it in operation for a considerable time.

Then I experimented to get the maximum velocity inside the venturi tube, and got velocities as high as 1,700 or 1,800 feet a minute and ran them singly and in tandem; but the intake pipe turns were very narrow and they could not get around with the intake mixture and made it impossible to work it out. Then there remained to use a combination of both. **You want hot air and a good mixing chamber at the same time to get the proper gas analysis.**

I made glass Venturi tubes and glass intake pipes so I could find out exactly what was going on inside the engine, and I found that with any form of carbureter, I don't care what it is—I don't believe anybody can make a form of carbureter in which when the velocity in the intake tube goes below 5,000 feet a minute you will not get a condensation in here. I have been unable to find any one that would not do it. I do not mean in the intake, I mean in the carbureter itself. You cannot drop below 5,000. To get the best results you should have about 15,000. **The object of the whole problem is to design a carbureter to give you a high velocity in there and at the same time do it with the least expenditure of power, and that has been done in several commercial forms. There are several of them that are pretty good.**

Now the object I had was to find out what was theoretically possible in the engine. In the first place, how little gasoline can you run with, how many cubic inches of cylinder capacity can you make per pound? That is the question under the very best possible conditions that are obtainable. I worked it out with light conditions, the engine running idle and on the road and found there was very little difference. I found the engine would make very little difference, and use the same amount running idle as under 10 per cent. load. You can run down to the same point, run the oxygen up and then run it down to a certain point in decreasing the volume in the cylinder. I found that you could run down to one-fourth cylinder volume; and when I got below full cylinder, to one-fourth cylinder full, then I would begin to get a mixture that is too lean, and on running your oxygen up to 6 per cent. and your CO up to 8 per cent. you can get a maximum lean mixture that you can run on, but you would not run as well as you would with the oxygen around 12 and the CO around 2. Then by running the volume down so that it will take in as little of the stuff as possible you get the very best that was obtainable.

Then taking these conditions out on the road I used them as a standard for what is obtainable on the oxygen. For instance, I figured out the gearing, the number of cubic inches of cylinder capacity per mile; then I know theoretically what it ought to take to run that car, and then I find out what the car is really doing under ordinary road conditions, and in that way you can tell whether the carbureter is really any good or not. And, as far as I know, that is the only way to tell, and until I got those facts I could not really test the carbureter and could not tell what I got. I would get 10 miles on one and 15 miles on another, and I know that when I got 15 I did not know whether I was getting all it was giving or not, and whether I could get more yet; and having those facts in mind I do not think that you can get any more running an engine under load on the road than you can get running it idle, **but you can run a car at 20 miles an hour on the level, on a macadam road, with exactly the same amount of gasoline per cubic inch of cylinder capacity that you can run it idle.** For instance, the car I have now, the theoretical amount it should take is 15.2 miles to the gallon, running straightaway, and I operated it last summer in Europe at 14 miles during the whole season, and very often operated it for a whole day's run as high as 15 miles; and if I ran long grades and coasted down high grades, for instance, around Central Park, I can drive around Central Park, New York, within the theoretical amount; that is, I can drive around Central Park with less gasoline than I can run the engine idle, but that is upgrade, long grades and shutting off the motor.

Now, what are the best mixtures? I found them afterwards; that would be approximately the mixture and maximum efficiency of power.

For greatest power efficiency on the road the following analysis is desirable:

CO_2	13.5 per cent.
O	.1 per cent.
CO	.2 to.3 per cent.

The maximum efficiency mixture gives an exhaust analysis as follows:

CO_2	12.5 per cent.
O	2. per cent.
CO	0.

In the best power mixture, sometimes, CO can run even a little higher than that given. The reason that you have CO is because you cannot get a perfect mixture in your intake pipe and carbureter, and if you do get a perfect mixture and the motor is throttled down a little you have an explosion here after it passes the throttle, and you have a suction on the intake pipe. If you have a suction in the mixture in the carbureter it need not be in the intake pipe, and that will increase the temperature. And if it was right when it passed that carbureter you would have a vacuum caused there by the suction. For instance, I have a suction on the intake pipe and it operates on the road about 15 inches of mercury suction running at 20 miles an hour, and running idle it runs from 3 to 4 inches of mercury suction, and when it is pulling, say, a 5 per cent. grade, with full load of passengers at high speed, it will run probably 10 inches of mercury, and

when I cut down the full power of the motor, driving, say, 10 miles an hour, at full engine power, the suction will drop to 2 inches.

I tried a very long series of experiments on the subject to find out what the effect of the suction on the intake pipe was, both in gas analysis and on the power, and I found, roughly, about 1 inch of mercury suction would affect the car 10 per cent. That is approximately the loss; that is about 3 inches of mercury suction. So if you could cut it down to nothing you would increase your power by 30 per cent. That is on three or four different engines, and I suppose they are engines that would vary on account of friction in the pipe. If you do not have a high suction you do not have high speed. You do not have 5,000 feet there unless you have a mercury suction to draw it through, and that comes from the centrifugal blower. And I think in that way that you can increase your power over 30 per cent. for any commercial vehicle to-day; but then your heat would go so high on your cylinders that it would not work. In my tests I used two cars, a four-cylinder that averaged 21 to 24 miles per gallon and a six that averaged 14.5 to 15. You cannot make a carbureter which will start the engine cold and be running satisfactorily when the engine is running hot. That is, there is a difference of 15 per cent. in gasoline mixtures between cold and hot air. You have got to compensate that in some way, and the way the ordinary man compensates for it is by setting the thing so it runs too rich all the time.

Regarding the relative merits of rough and smooth intake passages I found at my works I gained three-quarters of a mile sometimes when I made the thing rough. In other words, I get a better mixture of the gasoline thrown against the walls of the rough surface than with the smooth, and the exhaust gas analysis showed up much better with the rough intake manifold. As far as I am concerned, I want them just as rough as I can get them, but not with sharp corners, without any interruptions to the flow of the gases. But the rougher the surface is the better you are off, the better mixture you get, the better exhaust analysis you get.

The best method for breaking up the globules in an intake manifold is a series of plates, perforated with holes, five or six or seven of them. The gasoline will drop over the top of the plate and drop through the holes, and the draft pouring up through the holes tears the gas all to pieces on the edge of the holes. That is much better than by suction and with the screen. It breaks it up better and offers much less resistance. It is better than anything on the market with screw propellers and so on.

The question of properly filling the combustion chamber is an important one in carburetion. I had a truck engine which was operating very satisfactorily. The crank over the compression was exactly 78 pounds. In the revising of the same engine I changed the valves, changed the lift and the position of the cams, altered the intake pipe and carbureter resistance and left the compression and speed the same. When I first put the engine on the blocks it knocked very badly at about 700 or 800 revolutions, carrying the full load, and after working with it a few days I found out that the compression was too high. So I lowered the compression and had 72 pounds crank over and the knocks disappeared. In other words, the old engine did not fill the cylinders full. The design was such that it did not get the full 78 pounds running. After I got at it I went over it and tested it and I found only two points it knocked, one was 66 and the other was 76. When it was 76 it was knocking and when I got down to 72 it would not knock. In other words, about 72 pounds is about all you can safely carry.

But the advantage of putting gas in under compression would be only at high speed. You can design an engine up to 1,000 revolutions, which will practically fill itself full. But if you design one up to 12,000 your friction on the intake pipe is going to increase by the square of the speed and decrease with the square of the volume. If you have one of 72 pounds up to 2,000 revolutions, if you get up to 1,600 you would probably be down to 60 pounds on your volumetric efficiency.

EDWARD R. HEWITT.

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Discussing Three-Point Suspension

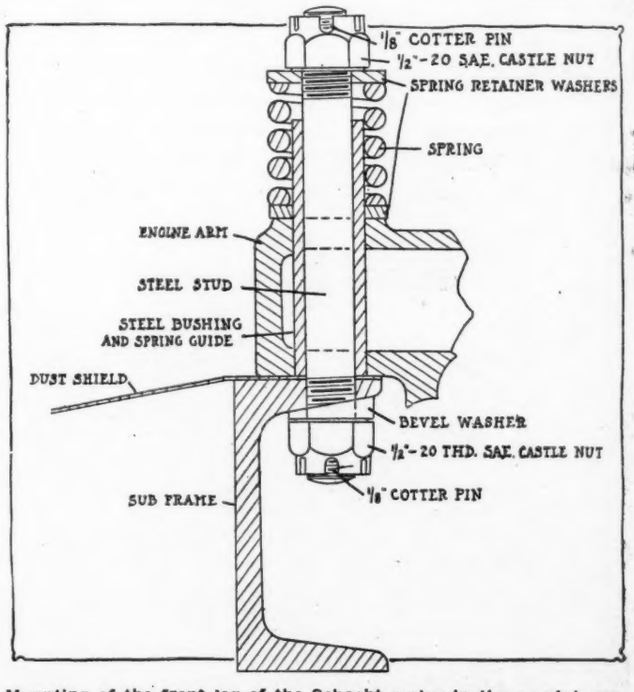
BOSTON, MASS.—Editor THE AUTOMOBILE:—In regard to the three-point vs. four-point suspension controversy which I have noted from time to time in your Engineer's Forum columns, I would like to say that I believe many of the so-called three-point suspensions are in reality four-point suspensions. The reason for that is the fact that the single member has often two points of support which though close together are still wide enough apart to form four members. This construction cannot by any stretch of the imagination be called a three-point suspension and is bad from a standpoint of rigidity as well as flexibility. I am a firm believer in the three-point suspension when it is really such and not a misnamed four-point affair. I sincerely trust discussion on this subject will go on as I believe there still remains a great amount to be said and as far as I have seen I do not believe the heart of the matter has as yet been reached.

A. P. STEIN.

NEW YORK CITY—Editor THE AUTOMOBILE:—With further reference to the article in issue of December 19, 1912, AUTOMOBILE, page 1277, "3-point vs. 4-point," etc., would advise that we have had quite a little success in tests of the spring under the engine stud nut.

It has occurred to the writer that it might be of interest to the readers as to how this construction was arranged and we are enclosing a sketch, which is reproduced in the illustration shown at the bottom of this page. We are placing this at the two front legs of engine only and the action is wonderful. It certainly relieves the motor and frame of heavy twists and strains and we feel quite certain that we are to reap some benefits from this type of construction.

A. SCHIMPFF



Mounting of the front leg of the Schacht motor in three point suspension scheme as described in above letter

Electric Cranking and Lighting

Part IV.

Telling the Story of the Storage Battery Required for the Electric System of a Car and Outlining Its Care and Construction—Calculating Candlepower and Correct Wiring

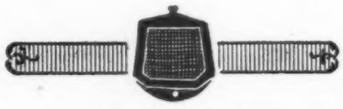
Subject Digest

¶ The lighting battery is not capable of taking care of the sudden load imposed by the cranking motor. The ignition battery is incapable of handling lighting or starting, therefore the batteries must be redesigned when a cranking system is fitted.

¶ The principal difference between batteries designed to give a slow discharge and those intended for a sudden and rapid current flow is in the plates. For slow discharge a few thick plates are used, for sudden discharge many thin plates.

¶ The electric cranking motor is generally more efficient in higher voltages, but the weight of a 6-volt storage battery is less for a given capacity than any other. With an increase in battery weight, there is an increase in cost.

¶ One of the first duties of a user of a storage battery is to see that it is kept filled with water. This means attention at least once a month. The batteries for this reason must be mounted accessibly.



STORAGE batteries used for lighting, igniting and starting while they resemble one another externally are quite different in their internal construction. This particularly applies to batteries which have to be used in conjunction with an electric cranking motor on an automobile.

The lighting battery which has been extensively used during the past two seasons is very similar to the one which is now supplied for electric starting. It lacks capacity more than anything else to make it applicable to the latter duty. On the other hand the ignition battery is inapplicable to either lighting or starting duty. Just as the lighting battery lacks capacity for starting purposes so does the one used for ignition purposes only that the latter is lacking in a greater degree than the former.

For example just compare the capacity of three batteries, one for starting, one for lighting and one for igniting purposes. If we make the comparison with 6-volt batteries the capacity will then depend only on the number of amperes discharged continuously. A starting battery is rated at 100-ampere-hour capacity when it will discharge at the rate of 5 amperes for 20 hours continuously. A lighting battery with a rating of 80 ampere-hours capacity will give 5 amperes for 16 hours continuously. The ignition battery rated at 40 ampere-hour capacity will give only 0.5 ampere but will deliver this for 80 hours continuously. For lighting, a battery should always be able to deliver at least 5 amperes continuously for 10 hours. This would easily be accomplished by the lighting and starting battery but would be impossible with the ignition battery. The latter is not designed to give such a high rate of discharge.

There is little difference in the construction of lighting and and starting batteries. The greatest difference in these is the capacity. Capacity in this case only means a greater factor of safety. Therefore, it may be said, that the construction of the ignition battery prohibits its use for starting purposes but that a large lighting battery may be used for starting because it is of the same general construction as that generally used with electric cranking motors.

Difference in Battery Construction

The principal difference between batteries designed to give a slow discharge and a quick discharge is found in the plates, the ignition type of battery having a few thick plates while the lighting and cranking battery has many thin plates.

The essential requirement for rapid discharging is large plate area per ampere discharged. This is just what is accomplished by the use of thin plates, for when two plates replace one the effective area is doubled.

In practice this doubling of area is accompanied by the reduction in thickness of plate in order to keep the size of the battery about the same as before. It also has an important bearing on the discharge rate which may be obtained from a battery and also the capacity or length of time that the battery will give this discharge. The gain is due to the shortening of the distance which the electrolyte has to travel to reach the center of the plate.

The difficulty which accompanies the thin plate is to prevent the active material from falling out of the grids during rapid charging. This in the past has been one of the weaknesses of this construction. It has been largely overcome in the latest batteries of the thin plate type. But less fear need be had of such difficulties in the average electric lighting and starting system as applied to automobiles because the rate at which the batteries are usually charged is far under that which would be likely to cause disintegration of the active material and the grids. Hence, the automobile user enjoys the advantages of high discharge rates, inherent in the thin plate battery and at the same time is insured against short battery life whih comes from too rapid charging, a common occurrence in power house work.

A brief examination of the battery construction will explain

why the thin plate is so much more efficient when a high discharge rate is desired. The battery plate or grid pasted with active material can be compared to a sponge. In order that the electrical discharge may take place it is necessary to have the sulphuric acid solution, H_2SO_4, or the electrolyte throughout the plate just as the water fills the pores of the sponge. As the electrical discharge takes place the sulphuric acid in the interstices of the plate becomes changed to water and hence diluted. With this dilution of the electrolyte the output of the battery will fall off. If the discharge is stopped for a short time the acid will penetrate into the plate and bring up the specific gravity again to normal and the same high rate of discharge may be continued until the renewed solution is diluted.

What this has to do with thin plates will now be considered. Note the section of the two plates, A and B, in Fig. 2. The distance from the center of the plate to the outside in the case of B is twice the distance of that in B, that is, the distance, L, is twice the distance, D. The time that it takes the acid to penetrate to the center of the plate A will probably be twice as long as is the case with B. In short the replacement of the electrolyte is about twice as fast in B as in the A and so that a much higher rate of discharge can be taken from B without the dilution of the electrolyte affecting it. This is the secret of the starting battery now used.

For a short time or until the electrolyte is diluted so as to bring down the output, a very high discharge can be obtained from almost any battery. To illustrate this a very interesting experiment was performed many times a day at the booth of the Electric Storage Battery Company, during the New York shows. The apparatus is shown in Fig. 4. It consisted of a single cell taken from a 3-cell, 6-volt starting and lighting battery. It therefore, gave 2 volts approximately. This was connected up across a shunt so that the amperes used could be measured with an ammeter. A switch was also placed in the circuit and very large wires were used everywhere in order to reduce the loss of voltage and current. Across two binding posts in the circuit was clamped an ordinary eight penny wire nail. This was about 1-8 inch in diameter. When the switch was closed and the circuit completed, through the wire nail the latter began to heat up immediately. To do this about 1,000 amperes were demanded from the battery, as the ammeter faithfully recorded. That so heavy a discharge could be obtained from so small a battery was surprising to many people. It proved that the ability of any electric cranking system depends on the size of the cranking motor, the gear ratio employed and the gauge of the wire connecting the motor, the gear ratio employed and the gauge of the wire connecting the motor and battery. It also proved that the only limit to the discharge rate in any system is the resistance of the outside circuit and the voltage of the battery.

Capacity of Storage Batteries

The rate at which a battery may be discharged is almost without limit as shown by the preceding illustration. The length of time which a battery will keep this discharge rate up is another question. This depends upon two factors: first, the number of plates in the battery and also upon the temperature of the battery. The capacity is also dependent upon the rate at which the battery is discharged.

The effect of the temperature upon the capacity of the battery is quite important. To better show the effect of a curve, Fig. 8 has been given. From this it will be seen that the increase in temperature above 80 degrees Fahrenheit has little effect upon the battery. On the contrary, when the temperature falls below 70 degrees the capacity of the battery steadily falls off. This decrease in efficiency of the battery is in direct proportion to the drop in the mercury. At 20 degrees below zero it will be noted that the per cent. of rated capacity is about 33 or the battery has only about one-third its normal capacity.

The next consideration of importance is the rate at which a battery is discharged. The number of ampere-hours which may be obtained from any battery varies directly as the number of hours taken to discharge that battery. In other words the slower we take the electricity from the battery the longer we can continue to take it. Also the number of ampere hours will be greater.

Take some specific examples to illustrate this point: first, note the curve, Fig. 11, which gives the Percentage of Rated Capacity, for any number of Hours Discharge Rate. This shows how rapidly the capacity of the battery falls off as the time in which it is fully discharged, is reduced. Also that if a battery is discharged at a rate slower than that at which it is rated, the capacity of that battery is much increased.

In Fig. 1 a comparison is made between the capacity of various batteries and the time each will burn under varying loads. A 6-volt battery is used in each case: one, of 80 ampere-hour capacity; another of 100 ampere-hour capacity and a third of 120 ampere-hour capacity. The lighting system is representative of that found on many small electrically lighted and cranked cars. The tail light gives 2 candlepower, the sides, 3 candlepower each and the headlights 21 candlepower each. This gives a total of 8 candlepower when the sides and tail are burning. With only the head and tail lights burning 44 candlepower is obtained and with all lamps lighted 50 candlepower is produced. The current required in each case is respectively, 1.68, 7.42 and 8.68 amperes.

With these lamp loads the 80 ampere-hour battery will keep

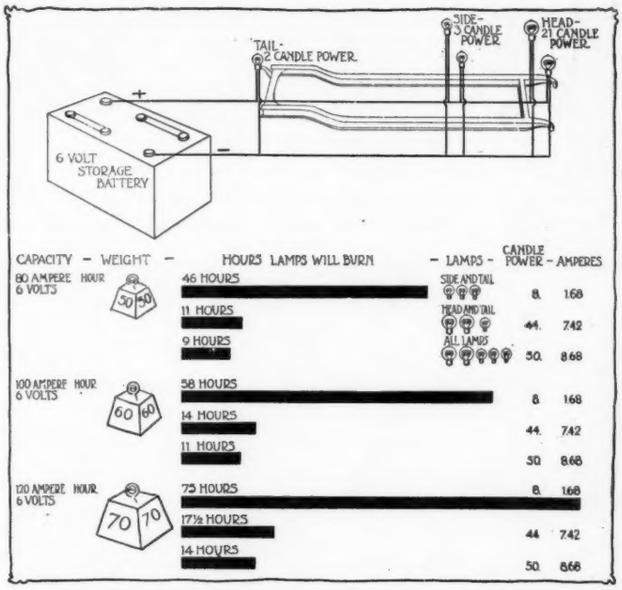


Fig. 1—Showing how long the lamps will burn with batteries of 80, 100 and 120 ampere-hours capacity

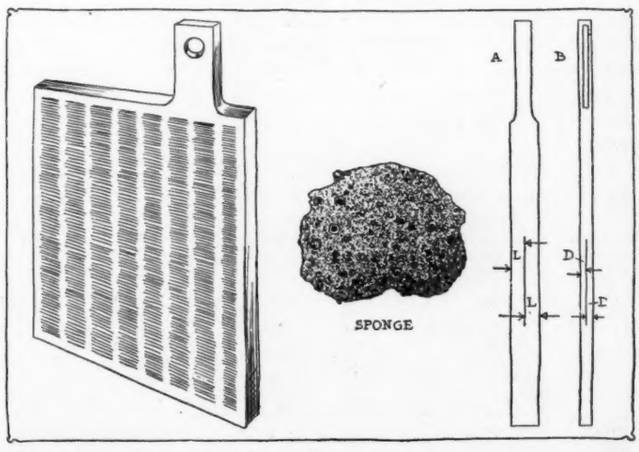


Fig. 2—Comparison of grid and a sponge, thick and thin plates

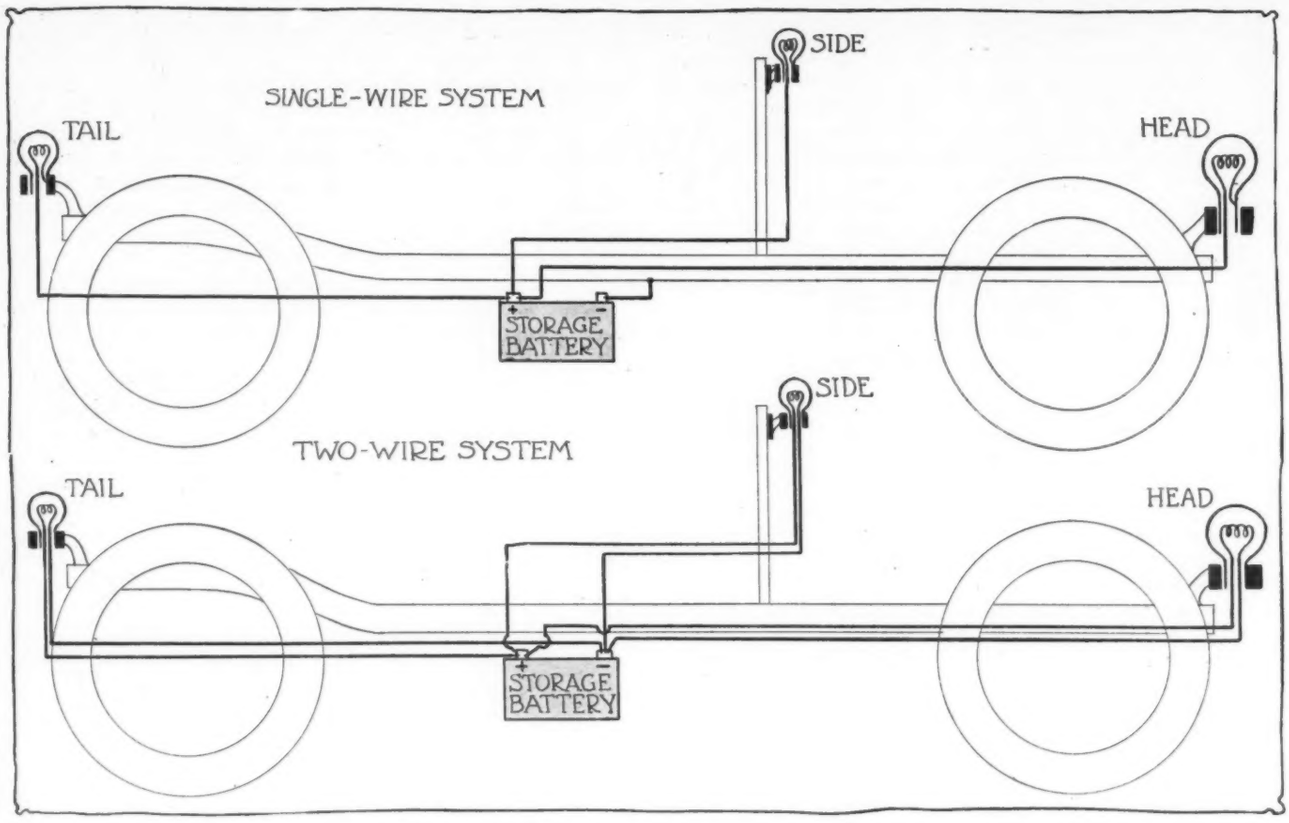


Fig. 3—Diagrammatic layout of the single-wire system as compared with the two-wire system of lighting

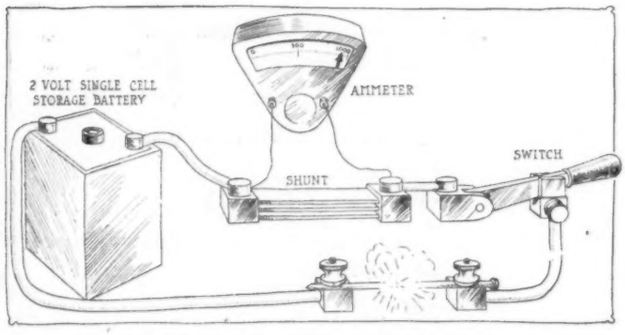


Fig. 4—Apparatus for rapid exhaustion of a cell

the lamps burning continuously for the following periods of time respectively; 46 hours, 11 hours and 9 hours. In short, the battery will keep the side and tail lamps lit five times as long as it will furnish current for all the lamps. This is very important to note because it means that the turning off of the head lamps when you stop the car will greatly increase the life of the battery and reduce the work it will have to do.

For comparison peruse the table below which gives the number of hours which each battery will burn the lamps.

Voltage	Battery Capacity	Hours Lamps will Burn Continuously	Lamps	Amperes Drawn
6	80	46	Side and tail	1.68
		11	Head and tail	7.42
		9	All lamps	8.68
6	100	58	Side and tail	
		14	Head and tail	
		11	All lamps	
6	120	75	Side and tail	
		17.5	Head and tail	
		14	All lamps	

Comparative Weights of Batteries

There is serious consideration of the question of voltage in lighting and cranking batteries. That which is most commonly used has 6 volts, although batteries which deliver, 12, 16 and 18 volts are also used to some extent. The 24-volt system is not mentioned here because it applies to the starting operation of two or three systems only and does not affect the lighting system at all. The lighting system in all 24-volt starting systems will be found to be only 6 volts. Where the higher voltage is used it is determined not by the lighting conditions but by the electric cranking motor which is usually more efficient under higher voltage. Higher voltage also means less loss of power or voltage head in transmitting the electricity from the battery to the electric motor. This brief digression is only to explain why a higher voltage than 6 is frequently used.

The weight of a 6-volt battery is less for a given capacity than any other. This is clearly shown in the curves which are plotted in Fig. 7. These curves were obtained from data on the weights of batteries furnished by one of the largest producers of lead plate batteries used for electric lighting and cranking. The solid curves show the weight of batteries in each of the four voltage systems, 6, 12, 16 and 18. The capacity being given with the weight in each case. The dotted curves, A, B and C give the direct comparison of the different size of batteries with the 6-volt ones. The curves, A, B and C being respectively for 12, 16 and 18-volt batteries. From this we can make a direct comparison. Take the 160 ampere-hour capacity. The weights will be as follows:

Voltage	Weight	Percentage Greater Weight. 6-Volt Battery Assumed as 100 Per Cent.
6	80	0
12	95	18.75
16	103	28.75
18	122	52.50

With the increase in weight there is a corresponding increase in cost of the battery. Hence both from the standpoint of cost and extra weight the higher voltage battery it seems would be less likely to be standard. As it is the 6-volt battery is used more widely than any other and the above comparison is really an explanation of this trend.

The method of obtaining the curves A, B and C should be

stated. It was assumed that the energy from a 12-volt battery was the same as from a 6-volt battery. If so, a 12-volt battery of 35 ampere-hour capacity is equivalent to a 6-volt battery of 70 ampere-hour capacity. In other words divide the voltage by 6 and multiply the ampere-hour rating by the quotient so obtained. This was done in each case.

Battery Under Operating Conditions

In order to illustrate the conditions of battery operation when starting the curves, Fig. 10. are given. These were taken from a 6-cylinder 4.5 by 5.5 inch motor. They show the load amperes required to turn this large motor over for 34 minutes continuously. They show in addition how the voltage of the battery is affected, how the temperature of the battery rises, how the specific gravity of the electrolyte falls off and the sudden drop in the revolutions per minute at the latter part of the run.

How closely the speed of the cranking motor and also that of the gasoline engine depends upon the voltage of the system can be very clearly noticed. The voltage curve and the revolution per minute curves are almost parallel to one another.

As a battery is discharged the electrolyte is gradually diluted and the specific gravity drops steadily. This is very nicely shown by the specific gravity curve in Fig. 10.

The temperature of any battery is raised quite a little during any continuous discharge of this character. This it is stated by different authorities will help to pull up the efficiency of a battery in cold weather if that is found necessary. But as was proven by the experiment wherein 1,000 amperes were drawn from a 2-volt cell, little difficulty will be found in getting enough amperes into the electric motor even under the worst temperature conditions. In connection with this it should be mentioned that the average 6-volt starting motor if locked so that it cannot start up will seldom draw more than 400 to 500 amperes. This is the condition in practice where the motor is frozen and can not be turned. This is enough to prove that other conditions rather than lack of current are going to prevent an electric cranker from operating in cold weather.

Standard Electric Lamp Sizes

The size of the lamps used in the systems now prevailing does not vary greatly. The 6, 8, and 12-volt lamps being interchangeable in the sockets provided, but a 6-volt lamp cannot be put in a 12-volt circuit. Four styles of lamps are furnished, these being shown full size in Fig. 6. The lamps all have the same size of Ediswan socket. The diameter of the bulb varying in each case. Another point which is not generally known is that the size of the bulb is no criterion of the candlepower of the lamps within a certain range. For example the 2.0625-inch lamp may be 24, 21, 18 or 15 candlepower, the only difference being in the size of the filament. In buying lamps the maker's stamp would be on the outside and the purchaser should carefully see that this is correct.

Two difficulties arise from not using the right size of lamp: first, you do not have uniform lighting due to the fact that the new lamp is of higher or lower candlepower than the one it replaces and second it may take more current than the old lamp,

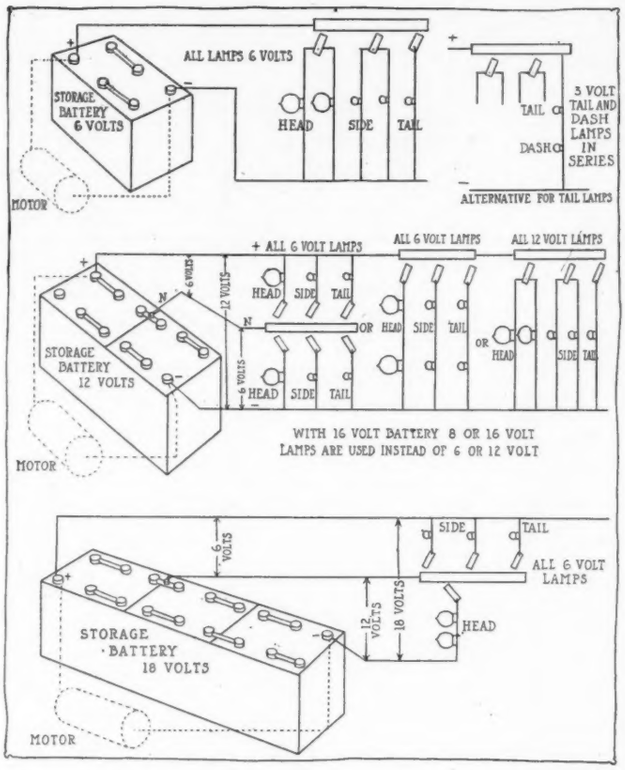

ALL LAMPS 6 VOLTS
STORAGE BATTERY 6 VOLTS
HEAD
SIDE
TAIL
DASH
3 VOLT TAIL AND DASH LAMPS IN SERIES
ALTERNATIVE FOR TAIL LAMPS
MOTOR
+ ALL 6 VOLT LAMPS
ALL 6 VOLT LAMPS
ALL 12 VOLT LAMPS
STORAGE BATTERY 12 VOLTS
WITH 16 VOLT BATTERY 8 OR 16 VOLT LAMPS ARE USED INSTEAD OF 6 OR 12 VOLT
STORAGE BATTERY 18 VOLTS
ALL 6 VOLT LAMPS

Fig. 5—Method of wiring lamps and motor on a 6, 12 and 18-volt storage battery

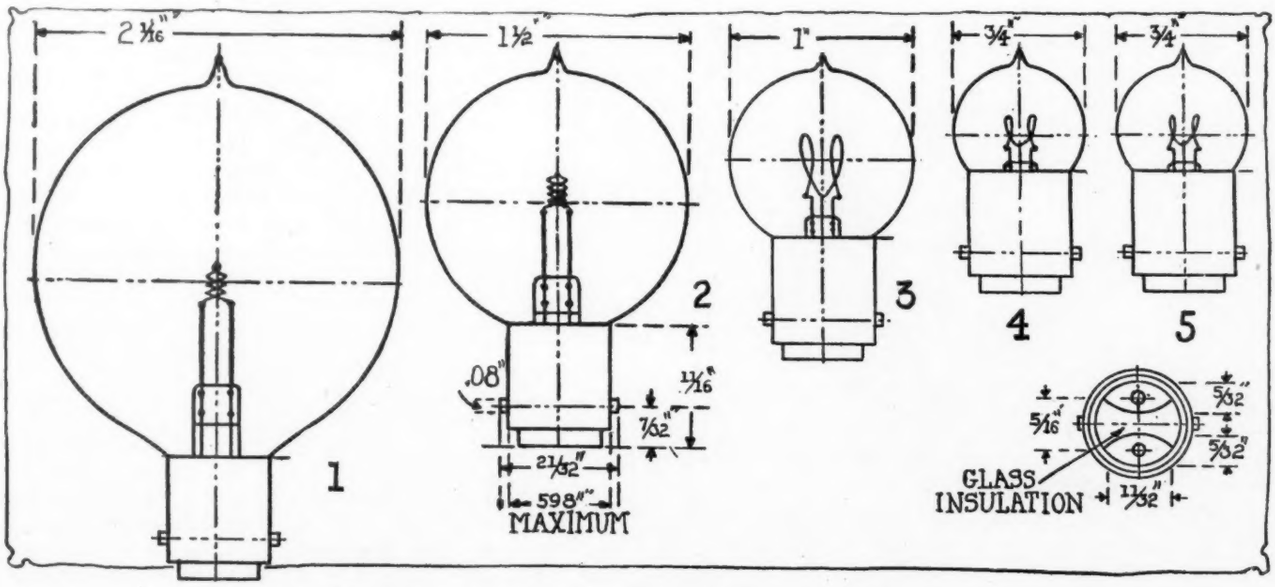


Fig. 6—Actual size of lamps now in use, showing the full size dimensions of the bulb and sockets

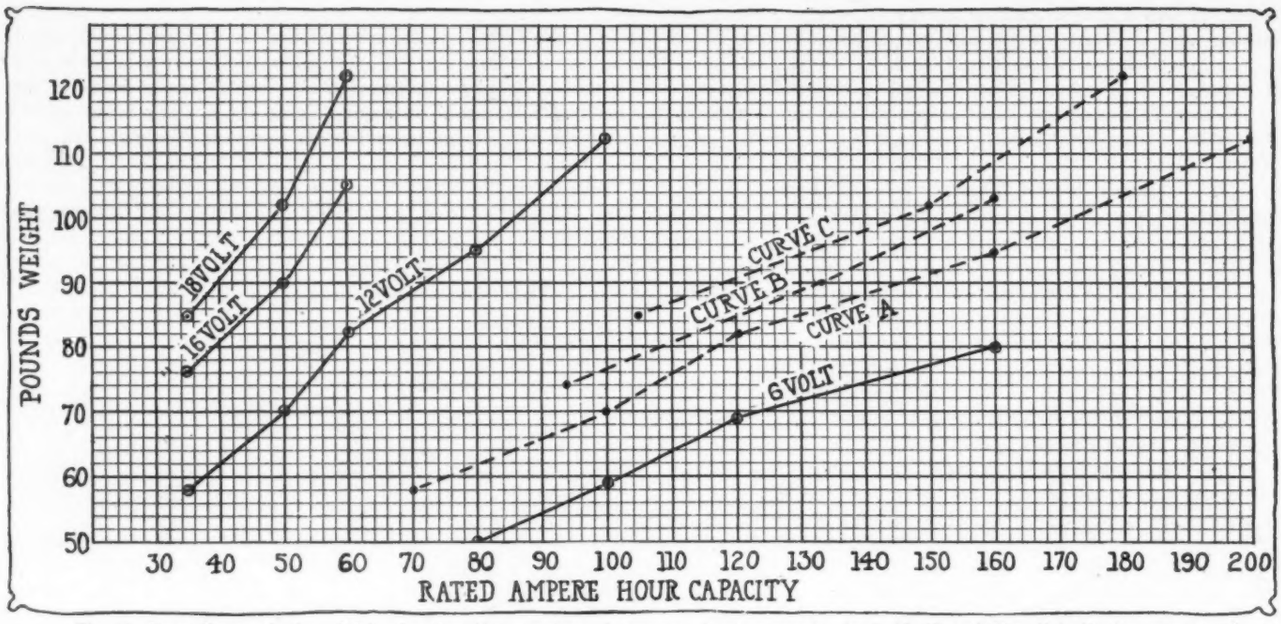


Fig. 7—Capacity against weight, showing the number of ampere hours capacity in 6, 12, 16 and 18-volt batteries per pound

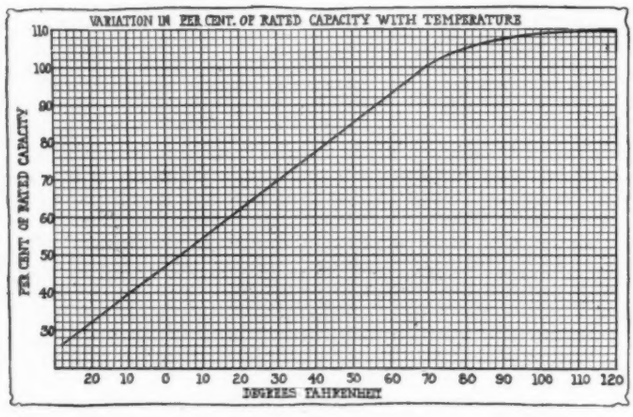


Fig. 8—Percentage of rated capacity secured at different temperatures

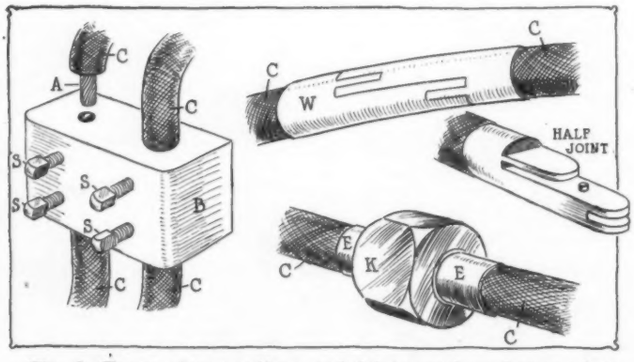


Fig. 9—Types of connections and joints used on heavy wires

provided it is of higher candlepower, in which case it may take more current than that for which the manufacturer designed the system. In the latter case the drain on both the battery and the over demand on the generator may ruin your battery through no fault in the design of the system.

Figuring Candle Power of Lamps

A very simple rule for figuring out the amperes taken by the lamps is as follows: Divide the candlepower by the voltage of the system. This only applies to the lamps giving more than 9 candlepower. For example take a 21-candlepower bulb. This will take 21 divided by 6, giving the result of 3.5 amperes.

Conversely you can judge very closely the candlepower of a new lamp after purchasing it if you will measure the amperes which it takes to burn it. The table which is given here will assist you in finding out. The easiest way is to turn off all lamps except the one which you want to test. Do not have the motor running. The ammeter with which your system is probably supplied will then register several amperes on the discharge side. This reading is the amperes which the lamp takes. To turn the other lamps off you only need to unfasten them in their sockets. A test like this is not difficult and is frequently very valuable as it prevents your using too large bulbs in your system.

Methods of Wiring Lights

Three methods of wiring are most in practice. In these it will be noted that the systems, whatever their voltage for charging may be, try to so arrange their wiring that 6-volt lamps may be used by the customer. This is due probably to the fact that 6-volt battery lighting systems have been used for some time and that 6-volt lamps can be obtained so much more easily than any others. Other reasons for the 6-volt system were given in connection with batteries. Fig. 5 has been prepared to compare these systems graphically and as simply as possible. Note that the 6-24-volt system used by some manufacturers is not shown here because in that system the lighting is all 6-volt and comes under the condition shown first in Fig. 5.

Treating each system briefly we find the following novelty in the 6-volt system. The standard wiring is shown in the first part of the cut. All the lamps are in parallel or across the line. One switch throws both headlights on, likewise only one switch is used for the side lamps. This is common practice on most cars although some provide a separate switch for each side lamp. By so doing the operator is permitted to leave the car standing at the curb with only one of the side lamps and the tail burning. This permits a slight economy in electricity.

The novelty in the straight 6-volt system is in connecting up the dash or speedometer light in series with the tail lamp. By so doing the operator is warned instantly by the extinguishing of the dash lamp if the tail lamp burns out. This also works vice versa and might force the operator to drive home without either tail or dash lamp. Where the tail lamp is independent and it burns out another bulb taken anywhere in the car may be put in place of the extinct bulb. This is not true of the two-lamp system mentioned first. In that the lamps are in series across a 6-volt circuit so that it is necessary to use 3-volt lamps. If one

of these burns out a 6-volt lamp will not replace it very well. It, however, only means that a 3-volt lamp must always be carried in reserve with this system.

The 12 and 16-volt systems are similar in all respects to one another except in the voltage and the number of cells possessed by each, the 16-volt battery having 8 instead of 6 cells. There are three possible ways of connecting up this system to the lamps: By the three-wire system with all lamps in parallel and using 6 volts; second, by putting 6-volt lamps in series across the line or by using 12-volt lamps. Note that in the above discussion 8 may be substituted for 6 and 16 for 12 volts. The only difficulty with the series connection of the lamps is that if one of the two burn out the other one goes also. With the parallel wiring each lamp is independent of the other and the burning out of one has no effect whatever on the other.

The 18-volt battery is used on only one lighting and cranking system. The connections are very simple. The small lamps are in multiple across one-third of the battery and operate at 6 volts. The headlights are on the other two-thirds of the battery which gives 12 volts, but as the lamps are connected in series they are ordinary 6-volt bulbs.

When the battery is divided as in the case of the 18-volt system or as in the first example of the 12-volt system it is very important that the current drawn from both sides of the battery be equal. For example, the 12-battery has one headlight burning on one-half the battery and the head on the other half. This gives perfect balance but it should be observed that if either one of these lamps is burned out and is not replaced for a considerable period, the battery will be rather unbalanced. For this reason in any system where lights are connected to the battery in this fashion it is especially important to replace a burned out bulb as soon as possible. This of course, holds true in any system, but more especially to this particular combination.

Single vs. Two-Wire System

A greatly mooted question at the present time is whether to use the two- or single-wire wiring system. Both have their champions and their points of superiority. The greatest point in favor of the single-wire system is the saving which it effects in the wire. The connectors used are not those which are shown in the cut of the bulbs, Fig. 6. In the lamps used in the single-wire system one side of the filament is grounded to the base of the lamp and the other electrode is in the center of the plug. The idea of the two systems is diagrammatically represented in Fig. 3.

The two-wire system is the most used one today and for that reason is most standard. However, one cannot overlook the single-wire system because it has decided merits and only needs support from the lamp and connector manufacturers to become more popular.

Couplings for Motor Leads

The wires from the battery to the electric cranking motor have to be very large especially in the 6-volt system in order to keep down the resistance. On this account there is some difficulty in making connections with them. As the current carried is very high, often reaching 300 amperes, it is important that these terminals be burned onto the battery and sweated into the switches, or other connecting points. In Fig. 11 some characteristic connectors used for this purpose are shown. Binding post connectors cannot be used because the wire used is too big. Take No. 00, very commonly used, and it will be found that it measures 0.4 inches in diameter over the copper strands, not over the insulation.

One method of connecting this is to remove the insulation from the wire. Clean and tin the ends thus uncovered and dip the end into molten solder. When this end is put into the hole of a junction box, B, and the set screw, S, brought down against it, perfect contact will obtain. This joint is far superior to one obtained by a solid copper wire in a junction box of this kind because the set screw squeezes into the soft soldered strands of the copper and will hardly work loose under any conditions.

The Westinghouse joint, W, is another one which is very neat and clean as well as serviceable. When it is connected it is protected by slipping a rubber tube over it and taping the ends down to prevent moisture working inside. The joint is exactly like an air brake hose coupling and because of the angle through which it is necessary to bend it in unfastening some difficulty may be experienced in installing it on some cars.

Every factory making automobiles has pipe couplings for their gasoline, oil lines, etc. These can very easily be used to good advantage as connectors for the main feed wires. They are very easy to handle in a small space. In Fig. 11 one of these is shown at K. The two halves of the coupling, B and E, have the ends of the wires, C and C, sweated into them. This coupling on account of the edges presented coupling must be well protected, otherwise it will soon chafe the insulation off and cause a short circuit.

Some Battery Box Pointers

The battery boxes for housing the battery of the lighting and cranking system must be so placed that it can be easily reached. This is important because one of the first duties of the user of storage batteries is to see that they are filled up with water. This should be looked after monthly. Two locations are now utilized for the battery, one under the tonneau floor between the frame and the propeller shaft; the other a location on the runboard.

The battery boxes in either case must be carefully enameled to prevent the fumes from the sulphuric acid from attacking them. The lining which is usually of wood should be thoroughly boiled in paraffine to protect them and increase their life. The box cannot be ventilated too well. It must also be carefully drained in order to get rid of any electrolyte which may be spilled.

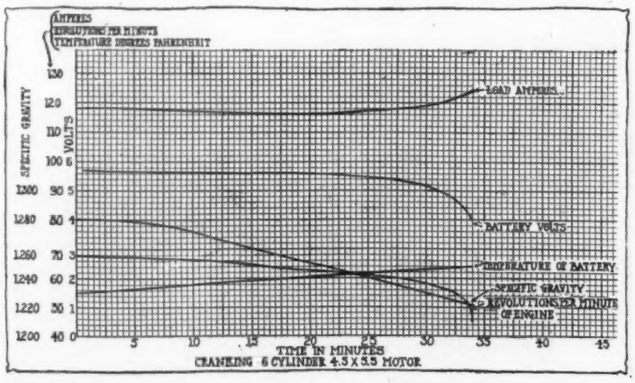


Fig. 10—Showing what happens to a 6-volt battery when cranking a motor

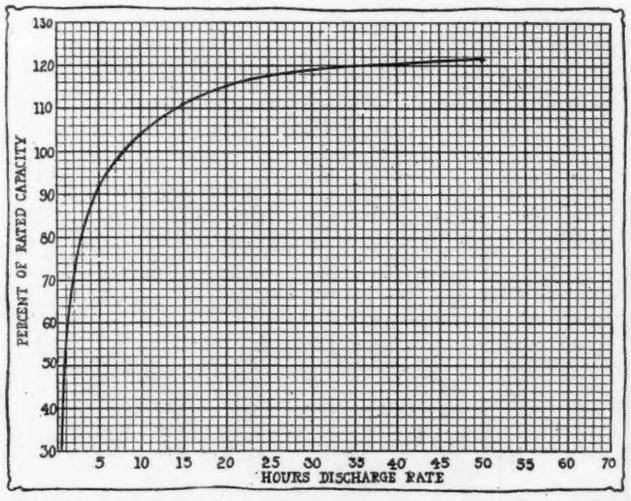


Fig. 11—Percentage of capacity obtained at different discharge rates

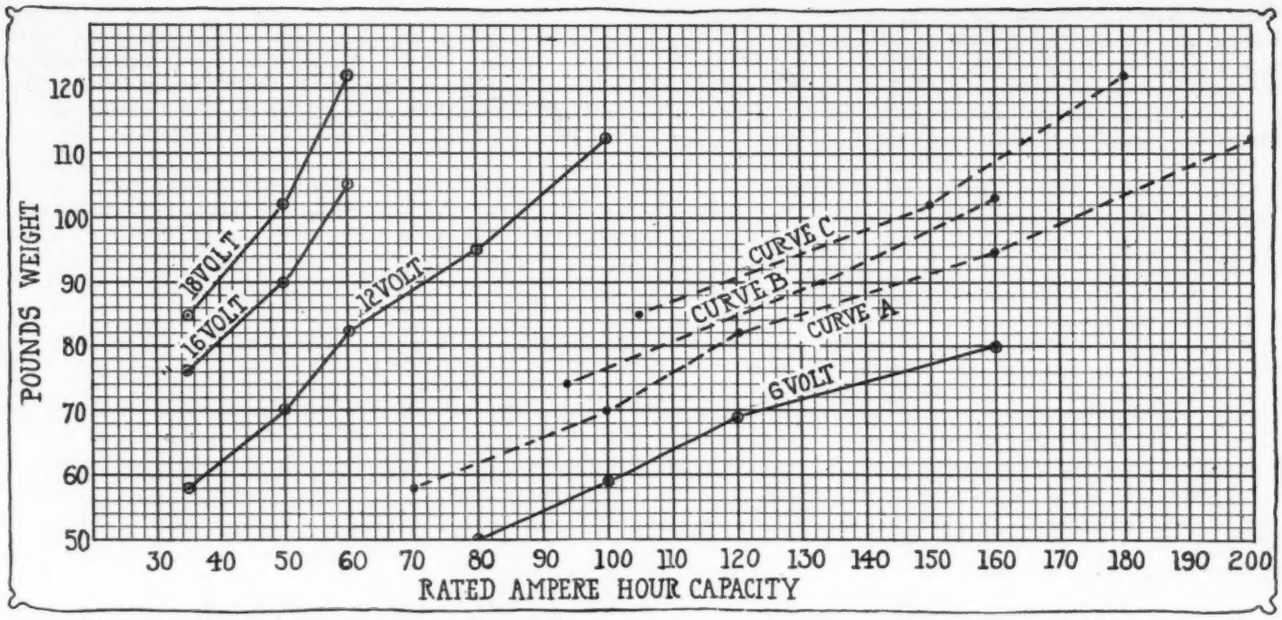


Fig. 7—Capacity against weight, showing the number of ampere hours capacity in 6, 12, 16 and 18-volt batteries per pound

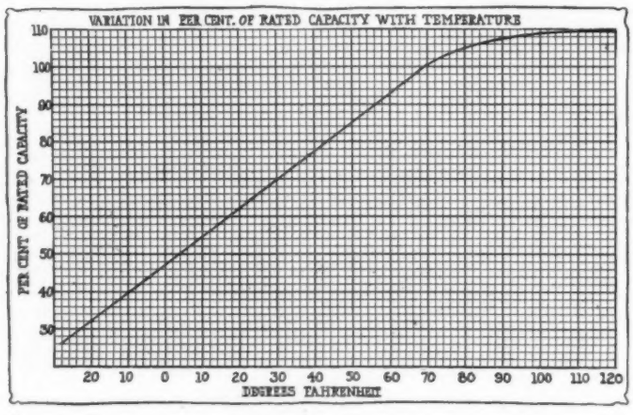


Fig. 8—Percentage of rated capacity secured at different temperatures

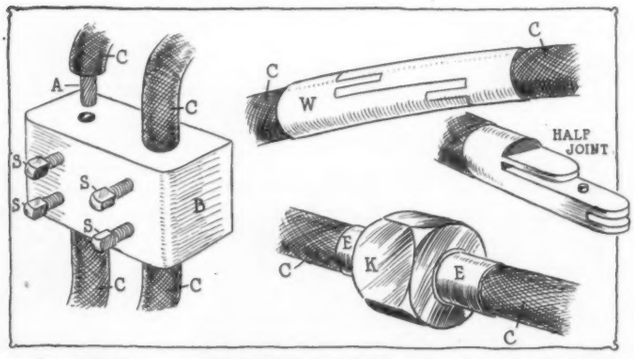


Fig. 9—Types of connections and joints used on heavy wires

provided it is of higher candlepower, in which case it may take more current than that for which the manufacturer designed the system. In the latter case the drain on both the battery and the over demand on the generator may ruin your battery through no fault in the design of the system.

Figuring Candle Power of Lamps

A very simple rule for figuring out the amperes taken by the lamps is as follows: Divide the candlepower by the voltage of the system. This only applies to the lamps giving more than 9 candlepower. For example take a 21-candlepower bulb. This will take 21 divided by 6, giving the result of 3.5 amperes.

Conversely you can judge very closely the candlepower of a new lamp after purchasing it if you will measure the amperes which it takes to burn it. The table which is given here will assist you in finding out. The easiest way is to turn off all lamps except the one which you want to test. Do not have the motor running. The ammeter with which your system is probably supplied will then register several amperes on the discharge side. This reading is the amperes which the lamp takes. To turn the other lamps off you only need to unfasten them in their sockets. A test like this is not difficult and is frequently very valuable as it prevents your using too large bulbs in your system.

Methods of Wiring Lights

Three methods of wiring are most in practice. In these it will be noted that the systems, whatever their voltage for charging may be, try to so arrange their wiring that 6-volt lamps may be used by the customer. This is due probably to the fact that 6-volt battery lighting systems have been used for some time and that 6-volt lamps can be obtained so much more easily than any others. Other reasons for the 6-volt system were given in connection with batteries. Fig. 5 has been prepared to compare these systems graphically and as simply as possible. Note that the 6-24-volt system used by some manufacturers is not shown here because in that system the lighting is all 6-volt and comes under the condition shown first in Fig. 5.

Treating each system briefly we find the following novelty in the 6-volt system. The standard wiring is shown in the first part of the cut. All the lamps are in parallel or across the line. One switch throws both headlights on, likewise only one switch is used for the side lamps. This is common practice on most cars although some provide a separate switch for each side lamp. By so doing the operator is permitted to leave the car standing at the curb with only one of the side lamps and the tail burning. This permits a slight economy in electricity.

The novelty in the straight 6-volt system is in connecting up the dash or speedometer light in series with the tail lamp. By so doing the operator is warned instantly by the extinguishing of the dash lamp if the tail lamp burns out. This also works vice versa and might force the operator to drive home without either tail or dash lamp. Where the tail lamp is independent and it burns out another bulb taken anywhere in the car may be put in place of the extinct bulb. This is not true of the two-lamp system mentioned first. In that the lamps are in series across a 6-volt circuit so that it is necessary to use 3-volt lamps. If one

of these burns out a 6-volt lamp will not replace it very well. It, however, only means that a 3-volt lamp must always be carried in reserve with this system.

The 12 and 16-volt systems are similar in all respects to one another except in the voltage and the number of cells possessed by each, the 16-volt battery having 8 instead of 6 cells. There are three possible ways of connecting up this system to the lamps: By the three-wire system with all lamps in parallel and using 6 volts; second, by putting 6-volt lamps in series across the line or by using 12-volt lamps. Note that in the above discussion 8 may be substituted for 6 and 16 for 12 volts. The only difficulty with the series connection of the lamps is that if one of the two burn out the other one goes also. With the parallel wiring each lamp is independent of the other and the burning out of one has no effect whatever on the other.

The 18-volt battery is used on only one lighting and cranking system. The connections are very simple. The small lamps are in multiple across one-third of the battery and operate at 6 volts. The headlights are on the other two-thirds of the battery which gives 12 volts, but as the lamps are connected in series they are ordinary 6-volt bulbs.

When the battery is divided as in the case of the 18-volt system or as in the first example of the 12-volt system it is very important that the current drawn from both sides of the battery be equal. For example, the 12-battery has one headlight burning on one-half the battery and the head on the other half. This gives perfect balance but it should be observed that if either one of these lamps is burned out and is not replaced for a considerable period, the battery will be rather unbalanced. For this reason in any system where lights are connected to the battery in this fashion it is especially important to replace a burned out bulb as soon as possible. This of course, holds true in any system, but more especially to this particular combination.

Single vs. Two-Wire System

A greatly mooted question at the present time is whether to use the two- or single-wire wiring system. Both have their champions and their points of superiority. The greatest point in favor of the single-wire system is the saving which it effects in the wire. The connectors used are not those which are shown in the cut of the bulbs, Fig. 6. In the lamps used in the single-wire system one side of the filament is grounded to the base of the lamp and the other electrode is in the center of the plug. The idea of the two systems is diagrammatically represented in Fig. 3.

The two-wire system is the most used one today and for that reason is most standard. However, one cannot overlook the single-wire system because it has decided merits and only needs support from the lamp and connector manufacturers to become more popular.

Couplings for Motor Leads

The wires from the battery to the electric cranking motor have to be very large especially in the 6-volt system in order to keep down the resistance. On this account there is some difficulty in making connections with them. As the current carried is very high, often reaching 300 amperes, it is important that these terminals be burned onto the battery and sweated into the switches, or other connecting points. In Fig. 11 some characteristic connectors used for this purpose are shown. Binding post connectors cannot be used because the wire used is too big. Take No. 00, very commonly used, and it will be found that it measures 0.4 inches in diameter over the copper strands, not over the insulation.

One method of connecting this is to remove the insulation from the wire. Clean and tin the ends thus uncovered and dip the end into molten solder. When this end is put into the hole of a junction box, B, and the set screw, S, brought down against it, perfect contact will obtain. This joint is far superior to one obtained by a solid copper wire in a junction box of this kind because the set screw squeezes into the soft soldered strands of the copper and will hardly work loose under any conditions.

The Westinghouse joint, W, is another one which is very neat and clean as well as serviceable. When it is connected it is protected by slipping a rubber tube over it and taping the ends down to prevent moisture working inside. The joint is exactly like an air brake hose coupling and because of the angle through which it is necessary to bend it in unfastening some difficulty may be experienced in installing it on some cars.

Every factory making automobiles has pipe couplings for their gasoline, oil lines, etc. These can very easily be used to good advantage as connectors for the main feed wires. They are very easy to handle in a small space. In Fig. 11 one of these is shown at K. The two halves of the coupling, B and E, have the ends of the wires, C and C, sweated into them. This coupling on account of the edges presented coupling must be well protected, otherwise it will soon chafe the insulation off and cause a short circuit.

Some Battery Box Pointers

The battery boxes for housing the battery of the lighting and cranking system must be so placed that it can be easily reached. This is important because one of the first duties of the user of storage batteries is to see that they are filled up with water. This should be looked after monthly. Two locations are now utilized for the battery, one under the tonneau floor between the frame and the propeller shaft; the other a location on the runboard.

The battery boxes in either case must be carefully enameled to prevent the fumes from the sulphuric acid from attacking them. The lining which is usually of wood should be thoroughly boiled in paraffine to protect them and increase their life. The box cannot be ventilated too well. It must also be carefully drained in order to get rid of any electrolyte which may be spilled.

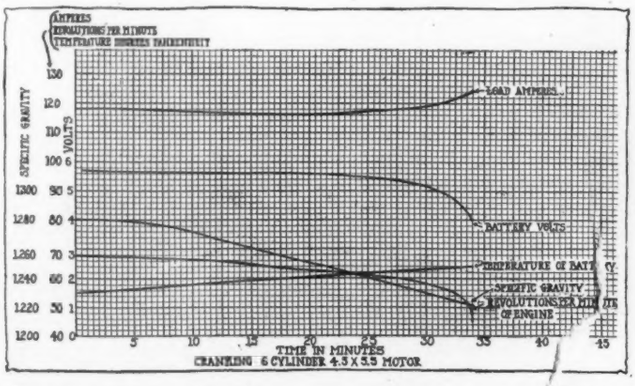


Fig. 10—Showing what happens to a 6-volt battery when cranking a motor

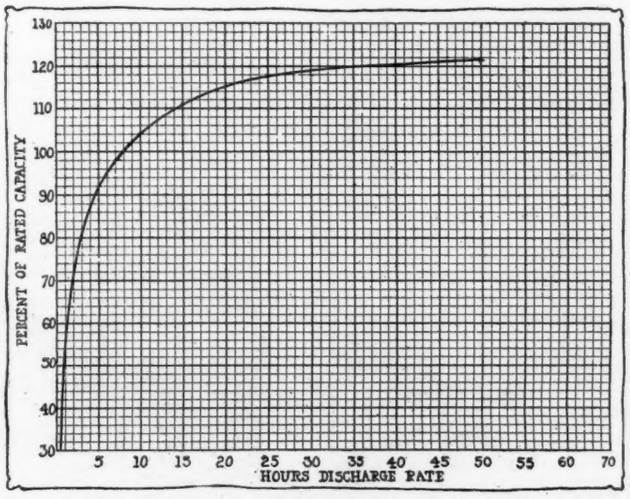


Fig. 11—Percentage of capacity obtained at different discharge rates

Electric Lighting of the Gasoline Car

Electricity now the Predominant Method of Car Illumination—Two Methods of Control in Use, Mechanical and Electrical—Field Strength Regulated by Differential Windings—One Maker Uses Magnetic Shunt

THE widespread adoption of electricity as a means of illumination is one of the noteworthy features of the 1913 cars. With the exception of some of the smaller and cheaper models practically all the cars on view at this year's shows were fitted with electric lighting systems, a clear indication that the present-day motorist is demanding the advantages offered by electricity in this connection. Electricity is an absolutely safe method. By adopting it all danger of exposed flame and lighted match, associated with the older lighting systems is avoided. Its extreme cleanliness and the fact that the lamps can be lighted without making it necessary that the driver leave his seat are also highly important points in its favor.

The chief essential of a satisfactory electric lighting system is that it can provide a uniform current at all times irrespective of the speed of the car, without the need of attention on the part of the user, and the variety of means by which this automatic regulation of current is effected forms an interesting basis of study. Broadly these methods may be divided into two classes: those in which the control is accomplished by mechanical means, i.e., by regulating the speed of the dynamo, and those where the current is maintained at a constant voltage through the electrical control of the generating power of the dynamo.

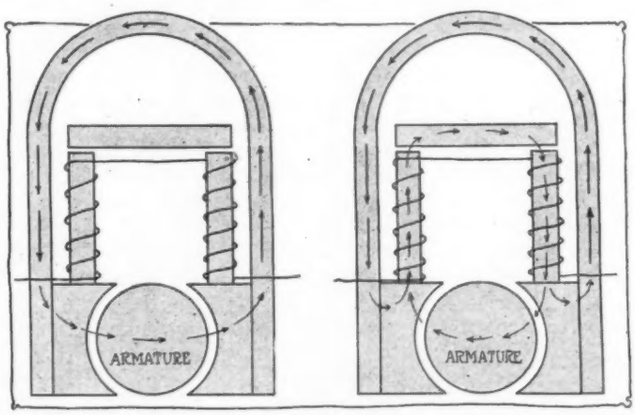


Fig. 1—Magnetic flux diagram of Splitdorf lighting generator

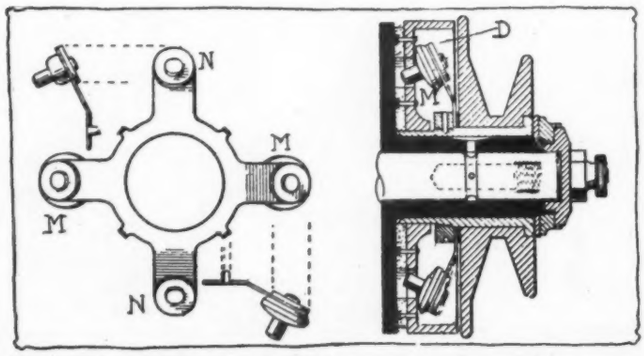


Fig. 2—Centrifugal clutch in Dynalux generator

In the first class some form of centrifugal clutch is the means employed. In the latter class the method generally adopted is that of varying the strength of the field magnets, by the use of a differential coil. This is a field winding so connected as to oppose the main energizing coil, and only comes into action when the generator is running at such a speed that the current developed would have an injurious effect on the lamps and battery. When running slowly the machine can furnish its full output by reason of the unimpeded power of its main field winding.

Dynalux—Controls by Speed

One of the simplest electric lighting systems is that manufactured by the Dean Electric Company, and called the Dynalux System. In this the generator has only two outside terminals from which wires extend directly to the battery without any intervening switches or regulators, all regulation being effected by devices contained within the generator casing.

The generator itself is of the cylindrical type with two poles, but differs from ordinary practice in that the magnet casing is built up from steel stampings clamped between two end rings. The poles form part of the stampings, and these are provided with a lip on one side only so as to facilitate the fitting of the wound field coils. Better commutation is also obtained by this one-sided extension of the pole face.

The armature is of the conventional slotted drum type run on ball bearings. A speed governor is fitted to one end of the shaft and an automatic cut-out at the other. Both these devices are mechanical in action, that is, they depend solely on the speed at which the generator is run. The cut-in is shown clearly in Fig. 3, the end cover being removed for the purpose. It consists of a disk D permanently attached to the armature shaft,

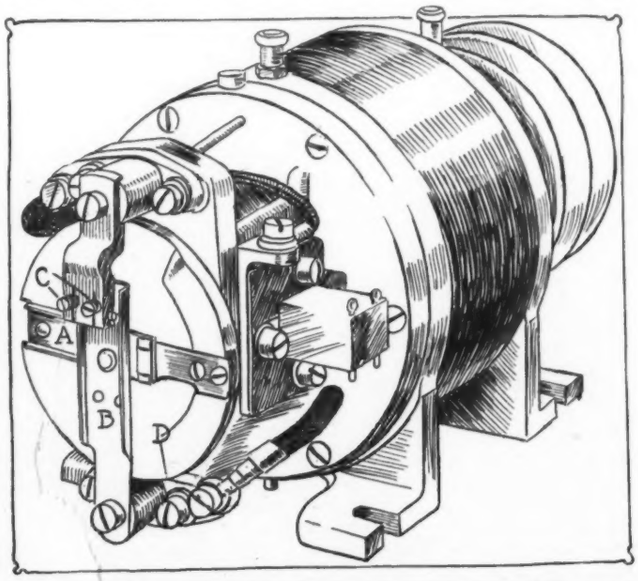


Fig. 3—Dynalux generator with cover removed, showing cut-in

on which is fitted the spring A. This spring is fixed at one end, but is free to move through a short distance at the other, which is provided with a light weight extending backwards in such a way that an increase in the speed of rotation causes the weighted end of the spring to move away from the face of the disk. In doing so the spring A carries with it the vertical spring B by means of an intervening fiber buffer at the center, bringing two tungsten contact pieces at the top in electrical contact with the corresponding screws C. These contacts carry the main current to the battery and lamp circuit, and are arranged to operate at 1,100 revolutions per minute, at which speed the generator is furnishing enough current to overcome the battery voltage, and supply the lamps. When the speed of the car is such that the current generated by the dynamo is greater than required, the centrifugal declutching device, Fig. 2, comes into operation, disconnecting the machine from its driving shaft. It will readily be seen that the same action also disconnects the generator electrically from the battery circuit through the agency of the cut-in just described, so that there is no possibility of the battery discharging through the windings. In the declutching device, four weights are arranged on a spider formed of spring material carried positively by the pulley. Two of these, M M, are slightly heavier than the remaining couple NN. At rest, and on low speeds, all of them force together the clutch faces. When the speed, however, reaches 3,500 the arms M and N let go, the former before the latter, and allow the pulley to run free. The lamps are then supplied from the battery. It should be understood that this only takes place during the short periods when the car is "speeding" above its average rate.

Splitdorf—Has Field Regulation

The Splitdorf "Triplex" generator belongs to that class in which the main field is produced by a combination of permanent and electromagnets. Its general appearance and the arrangement of the coils is shown in Fig. 6. The construction follows the lines of the ordinary magneto with the exception that only two pairs of permanent magnets are placed over the pole pieces F, the third being replaced by an electromagnet E. This magnet has compound energizing coils C consisting of a long shunt winding and a small number of series turns, both being connected so as to augment the existing permanent magnet field. This is a rather important point. They are not differentially wound so that the effect of one coil can be made to neutralize that of the other. Besides the field windings proper there are two coils D wound on short cores bolted to the upper face of the pole pieces. Their function is to reduce the output of the generator at high speeds by causing, or tending to cause a reverse flow of the magnetic lines of the field through the armature. This peculiar action and the ingenious arrangement by which it is obtained without demagnetizing the field magnets will be made clear by reference to the flux diagrams, Fig. 1. The diagram on the left shows the normal state of the magnetic flux, when no current is passing round the coils. The other diagram shows the passage of the flux when the differential coils are energized in a direction to oppose the permanent magnetization. It will be seen that although a reversal has taken place in the direction of the lines passing through the armature, the original flux throughout the main portion of the magnet is unchanged, and therefore the magnets are not being demagnetized.

The regulating principle of the system, as shown in the outline diagram, Fig. 5, is as follows: When starting up, the permanent magnetic field is sufficient to generate a quick supply of current at the brushes, and through the shunt field coil. The main contact A then closes, connecting up the generator to the outer circuit, first passing through the few series turns of the main field. As the speed increases the contacts B are opened by a further pull on the armature G, Fig. 6, cutting out the shunt windings and reducing the main field to such an extent that the generator is virtually running as a permanent magnet machine. Any further increase of the speed of rotation, and the consequent tendency to oversupply is taken care of by the differential windings D, which decrease the field strength as explained above. The nature of the output is given in the curves, Fig. 4. It will be observed that over a speed of 1,500 revolutions per minute there is a surplus of roughly 1.5 amperes over the lamp load, passing into the battery The readings here shown were taken with a full lamp load of 8 amperes and a 100 ampere-hour battery floating on the line as in the diagram of wiring.

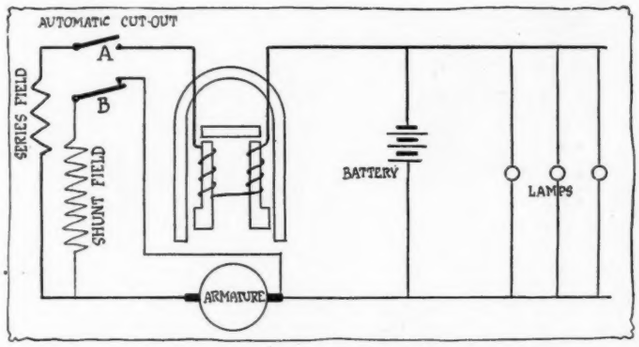


Fig. 5—Wiring diagram of Splitdorf lighting system

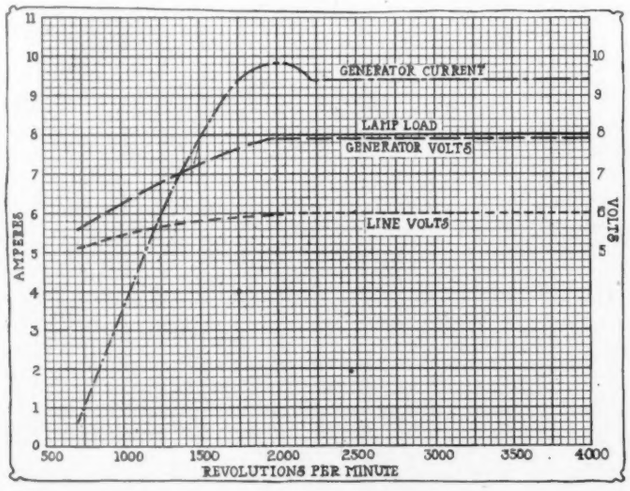


Fig. 4—Volt and ampere curves of Splitdorf generator at various armature speeds

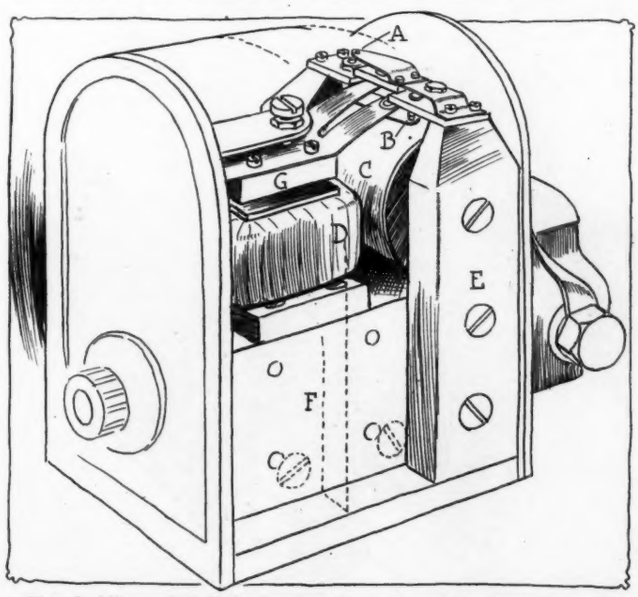


Fig. 6—View of Splitdorf generator with permanent magnets removed, showing current regulating device

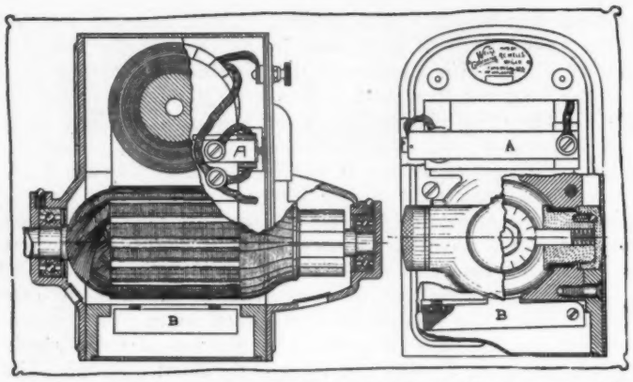


Fig. 7—Sectional views of Wells generator, showing magnetic shunt across poles

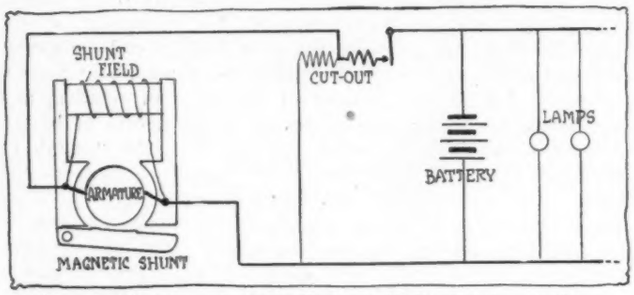


Fig. 8—Diagram of connections of Wells lighting system

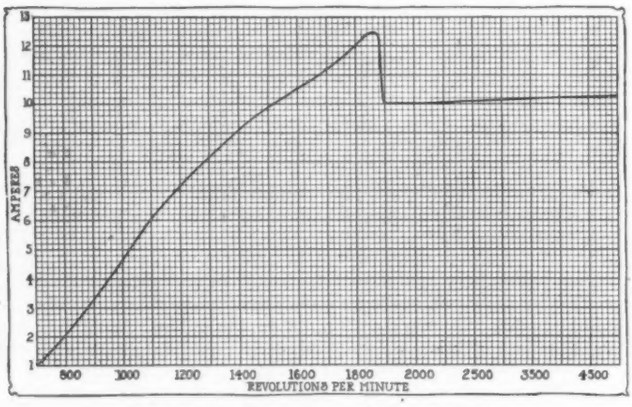


Fig. 9—Output curve of Wells generator

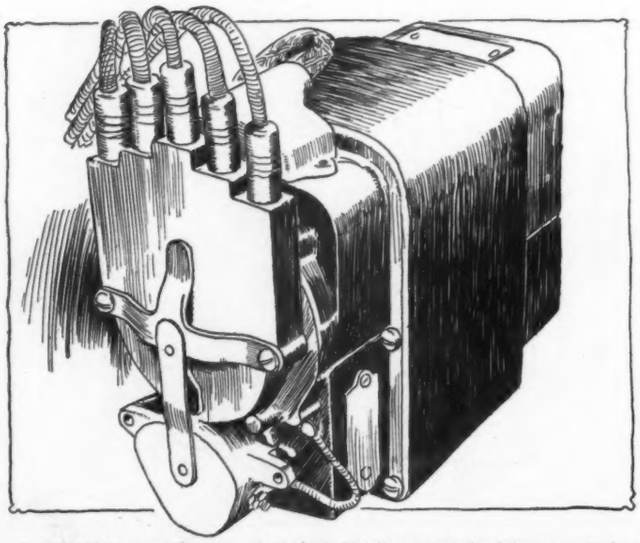


Fig. 10—View of Gould combined lighting and ignition generator

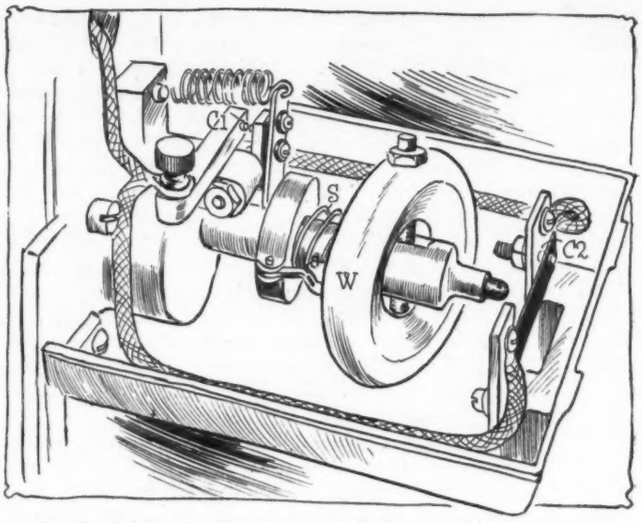


Fig. 11—Automatic cut-out and regulator on Vesta generator

The equipment comprises a fuse box containing a separate fuse for each lighting circuit, so that in the event of a possible short circuit the fuse of the particular line will blow out, eliminating the faulty circuit and preventing injury to the lamps. The fuse panel is designed to take the ordinary enclosed fuses and may be fitted in any convenient place, preferably on the dash under the hood. An ammeter is also included in the system. The dial is calibrated to show the amount of current being utilized for lighting and also the charging rate up to 20 amperes. On the discharge side of the scale readings can be taken up to 10 amperes.

The Splitdorf Company also manufactures a four-pole lighting dynamo of the electromagnetic type, with a cylindrical casing.

Gould—Employs Differential Windings

In the Gould system, current for both ignition and lighting is generated in a single unit, alternating current being delivered at one end of the armature and direct current for lighting at the other. Fig. 10 shows the external appearance of the dual machine, which is designed to run at engine speed. It will be noticed that the ignition end presents the characteristics of the ordinary magneto. The magnets are of the two-pole type in soft steel, but an unusual feature of their construction is that the core on which is mounted the field coils is made from hard steel. This is done so that there is always a sufficient amount of residual magnetism to ensure a prompt generation of current when starting up. It is not, however, enough to give the machine the operating characteristics of a permanent magnet generator.

The magnets are wound differentially, that is, there are two field coils, one being a shunt winding and the other a differential or bucking coil for the purpose of controlling the magnetizing power of the shunt coil. These are mounted on the hard steel core located horizontally above the armature. The pole pieces are made with extending lips in the direction of rotation in order to improve the commutation.

The armature, which runs on ball bearings, is of the drum type and carries two distinct windings, the first being connected to a collector ring from which alternating current is taken for ignition, and the second to a commutator at the other end of the shaft, furnishing direct current for the lighting and battery-charging circuit. Special care is taken to insure perfect insulation of the two windings. In a severe test the makers found that it was even possible to burn out one of the windings without impairing the function of the other.

The regulating devices of the Gould lighting system are contained in the upper half of the rectangular end cover at the commutator end. This half, being easily removable, permits a

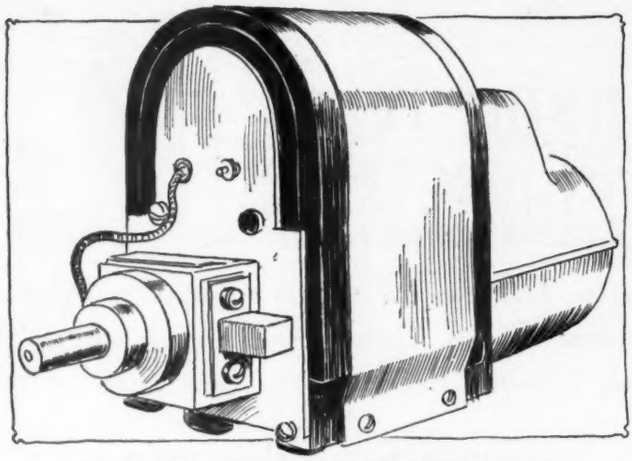


Fig. 12—Vesta permanent magnet lighting generator

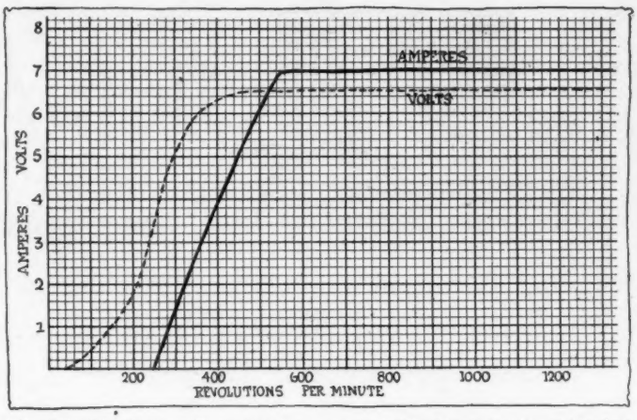


Fig. 13—Voltage and amperage curves of Gould generator, showing constant delivery above speed of 550 revolutions per minute

full inspection of the control parts as well as access to the brush gear. Fig. 16 shows the details of the regulator removed from the generator. Three magnetic control units A, B and C are arranged vertically within the cover. Located above them are two resistances of the enclosed type, D and E, which are used in connection with the regulation of the field coils. Each of the control units has a hinged armature; that of B normally rests in such a position that its contact points are open, while the armatures on A and C normally keep their respective contacts closed. Their action may be followed by referring to the diagram of wiring, Fig. 15, in which A is the differential relay, B the cut-out and C the potential relay. The two resistances represent D and E respectively. The operation of the system is as follows: When starting up from a condition of rest the current delivered at the brushes passes round the shunt field, augmenting the slight existing permanent magnetism of the field magnets. As the speed increases, current is generated at a sufficient voltage to actuate the cut-out through the fine winding shunted across the mains. This takes place at the comparatively low speed of 250 revolutions per minute, when the car is traveling approximately 7 miles an hour. The generator is then acting as a simple shunt machine, delivering current by way of the cut-out to the battery and lamps. At this time the differential field coil is not in circuit, being shorted by the closed contacts of the differential relay. But this device is so wound that when the full output is passing round its coil the armature lifts, opening the contacts and thus including the differential field winding in the main circuit. This weakens the power of the shunt field and holds the current output at a constant figure of 7 amperes on full load, as shown in the curve, Fig. 13, at all speeds above 550 revolutions per minute. The same figure also shows the constant voltage characteristic of the generator. This is accomplished at the higher speeds by alternately inserting and cutting out a resistance in the shunt field circuit, by means of the potential controlling device, as shown in the wiring diagram. In practice this action resolves itself into a constant vibration of the contact arm, but its effect is imperceptible in the lamps.

Wells—Uses Magnetic Shunt

A unique method of regulating the current supply is that incorporated in the Wells lighting generator shown in section, Fig. 7. The main field is produced by a shunt wound two polar magnet furnished with a single coil. Hinged to the base of one of the pole pieces is a magnetic shunt, B which normally is held away from the other pole by a pair of light springs. These springs are so proportioned that when the machine is tending to generate more current than is necessary the magnetic strength of the main field is such as to draw up the iron shunt and so permit a large portion of the magnetic flux to pass through it instead of the armature, thereby weakening the generating

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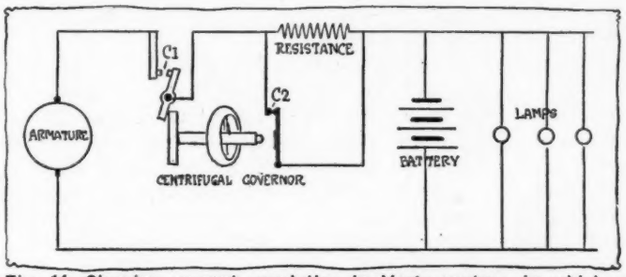

Fig. 14—Showing current regulation in Vesta system, in which a single step of resistance is inserted at high speeds

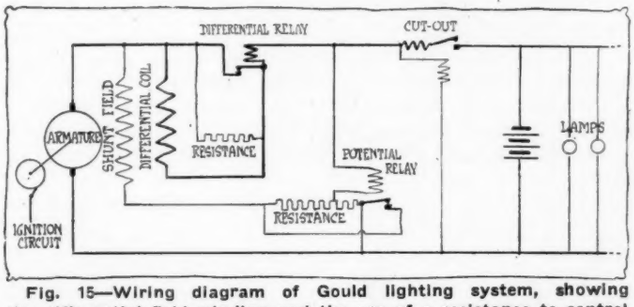

Fig. 15—Wiring diagram of Gould lighting system, showing the differential field winding and the use of a resistance to control the voltage

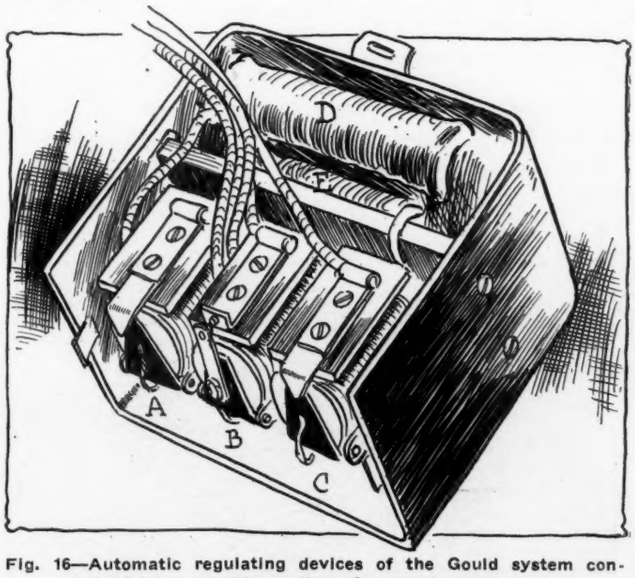

Fig. 16—Automatic regulating devices of the Gould system contained in removable portion of generator end cover

Mixing Kerosene and Ether—Changing From Detachables to Demountables—Cost of Ether—Good Selling Territory—Gasoline Burns Quickly—Using Natural Gas—Speedometer Deranged—Cylinder Design—Beck Motor Criticised

Wants To Use Kerosene and Ether

EDITOR THE AUTOMOBILE:—What proportion of washed ether or any other kind could I use with kerosene oil for fuel purposes?

For starting on cold days I have used fifteen drops of ether to a pint of gasoline. In December last on a day when the temperature was 10 above zero, I started the engine on the second turn, using the above mixture. It was necessary to prime a second time, as the engine became so cold in standing in a shed over night the gasoline would not vaporize until the engine became warmed up. Now, this mixture of gasoline and ether I know will do the work; but what proportion of kerosene and ether will be required?

Is kerosene heavier than gasoline? What air adjustment of a Stromberg carbureter would be necessary? Also, approximate cost of correct mixture, kerosene and ether, should be used to insure satisfactory results?

I can bear out what the correspondent says in your January 16 issue, page 241, under the heading Engineer on Ether, only I used unwashed ether and he used washed ether. His was one-half gas and one-half ether.

Please state the difference between washed and unwashed ether.

Albany, N. Y. FRANK DEWITT BROWN.

—THE AUTOMOBILE has no record of anyone using a mixture of kerosene and ether for running, and it appears that the cost of ether and kerosene combined would be more than the cost of gasoline alone. Therefore, it would hardly pay to operate on a mixed fuel of this nature, as the trouble of mixing, combined with the high price, renders it impracticable.

Kerosene is heavier than gasoline. If you used a fuel of this nature you would probably need a wider jet opening and about the same air opening. Washed ether is the commercial product as distinguished from the chemically pure product. It generally contains a slight amount of water and minor impurities.

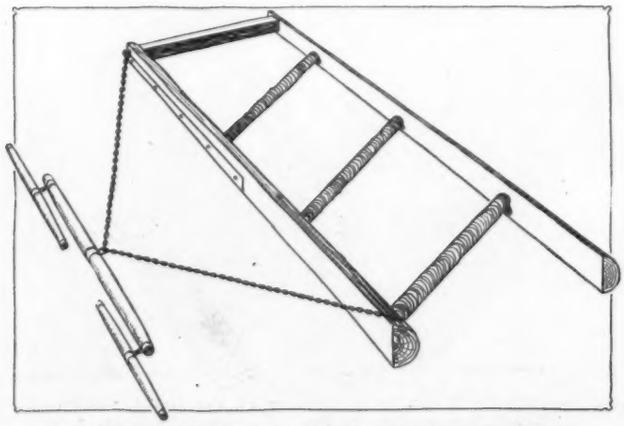

Fig. 1—Diagram of split-log drag, showing construction

Changing Over to Demountables

Editor THE AUTOMOBILE:—There is one subject which I have not noticed in the discussions in the Letters Answered and Discussed, which I think would interest a great many automobilists, and that is the advisability and cost of changing from the Q. D. to demountable rim, say in a 34 by 4-inch size.

What is the best method to use to prevent the sticking between the bead of an automobile tire and the Q. D. rims? It took me about 3 hours to remove two of my tires in preparing the car for its period of hibernation.

New York City, N. Y. T. D. MARTIN.

—There are many automobilists who are having this change made. The advantage, according to the views expressed by these people, is that it is possible to carry an extra tire, already on the rim and pumped to the proper pressure. This considerably lessens the time and trouble of a tire change on the road. The cost of making a change on the size you mention is $15 in the average case. The work required means sawing off the spokes for an inch and putting a new felloe band in place. It takes about 24 hours to get the job done.

If you will paint the rims with graphite paint you will prevent any tendency to stick. This sticking is due to rust, and can be prevented by using the paint, which is an effective rust preventive.

Use of Split Log Drag

Editor THE AUTOMOBILE:—I have before me a story on the split drag which you published some time ago. Would you tell me if the drag is of any use in heavy country?

2—Are there any axles which are composed of all roller or all ball bearings? I am referring to rear axles. Are both a necessity?

Richmond, Va. CHAS. KRUMP.

—The split drag is of practical use. In Fig. 1 is shown the form of the drag and Fig. 2 tells better than words what it can do.

2—The roller bearing axle is often fitted with a ball thrust as in Fig. 5, although the Timken axles use only taper rollers and other axles fitted with roller bearings capable of taking a thrust strain. All ball-bearing axles are common. One of this type is shown in Fig. 6.

Nearly Any Territory Good

Editor THE AUTOMOBILE:—Would you kindly tell me in what part of the country there is a good opening for a garage or sales agency? Also, what priced cars are favorites there, provided you know?

Akron, O. GILBERT E. WELLS.

—A study of the first seven pages of THE AUTOMOBILE for last week will show just where the cars are being used. A good medium-priced car can be sold in nearly any part of the country with success if the car is one that can be backed by a proof of good materials and service on the part of the factory. Any part of the United States where the roads are good and the

touring season is open for the major part of the year would promise success if combined with businesslike methods of selling the cars. According to statistics prepared by THE AUTOMOBILE, there is one car for every forty-four people in one state, while in another there is but one car for 700 people. Figuring the other states on this basis, as on page 329 of the issue of January 30, and combining that information with the population of the state and the number of automobiles in use in the state might give you an idea as to where to start an agency.

Does Gasoline Explode?

Editor THE AUTOMOBILE:—As a reader of your magazine, I take the liberty of asking you a question regarding gasoline vapor. Does it explode in the combustion chamber or is it a rapid-burning substance?

Youngstown, O. LEO LINBERGER.

—Gasoline burns very rapidly. It is impossible to draw a line between an explosion and exceedingly rapid combustion. The mixture in the cylinders of an automobile motor may be put in the latter class, however.

Running on Natural Gas

Editor THE AUTOMOBILE:—1—Please state what changes should be made so that an ordinary 4 by 4.5 motor will run on natural gas for fuel. It is a four-cylinder motor fitted with a Shebler carbureter.

2—How many cubic inches of gas would such a motor use per hour under average load?

3—The cubical contents of a steel tank is 9,240 cubic inches. How many cubic inches of gas will this tank hold at 100 pounds pressure per square inch?

—4—Is distillate a practical fuel for automobile motors?

Mondoc, Ind. T. C. KABEL.

—1—No changes will have to be made in the engine. The carbureter should be removed, however, and a mixing valve which can be secured from Lunkenheimer or any other valve manufacturer put on.

2—This would depend on the revolutions per minute. Assuming that the engine has a volumetric efficiency of 100 per cent, the approximate number of cubic inches used per hour would be the number of revolutions per hour multiplied by the piston displacement and divided by 10.

3—About 62,857 cubic inches at atmospheric pressure could be put into the 9,240 cubic inch tank at a pressure of 100 pounds.

4—This has not as yet been determined.

Horsepower of the Hupmobile

Editor THE AUTOMOBILE:—We note that in your January 9 issue you quote the S. A. E. rating horsepower for the Hupmobile 32 as 16.90, while the company's claim is 32 horsepower. Does the 5.50-inch stroke give the engine more horsepower than a 5-inch stroke?

La Feria, Texas. B. H. DUNLAP.

—The S. A. E. rating of the Hupmobile 32 motor is undoubtedly low. The motor should readily develop 32 horsepower on the block. It must be remembered that the stroke factor is not directly considered in the S. A. E. rating. A motor of 5.5-inch stroke would develop more power than one with a 5-inch stroke at the same number of revolutions per minute.

Speedometer Out of Order

Editor THE AUTOMOBILE:—I cannot speed my car, which is a 36 "Special" Maxwell 1912, higher than 35 miles per hour. The compression is good; valves had been recently ground; carbureter works well; there is no skip in the ignition from a foul spark plug, and the engine does not heat up. In fact, the car runs better after I have driven it 20 miles or so. I have taken off the fan belt in order to get the engine hotter. I have a hot air tube from exhaust pipe to carbureter. The car picks up to 30 miles very quickly, but in order to reach the 35-mile-

Fig. 2—Top: A drag in use. The man driving stands on the drag and adds his weight to the weight of the latter to get a better effect

Right: This shows a stretch of the same road after the drag had passed over it. When aided by a good sun this road was hard enough to stand travel for some time without rutting

Left: A stretch of road before dragging. This road was covered with a soft clay mud to the depth of about 5 inches

These three illustrations show actual work on the roads of one of our Southern states. The road in this instance was composed of a soft dirt or clay which made an excellent roadbed in dry weather, but which became a morass almost at the first touch of rain. By the use of the drag the community was able to keep the roads in a fairly good condition even in the rainy season. In winter the ruts which froze solid prevented satisfactory touring through this particular section

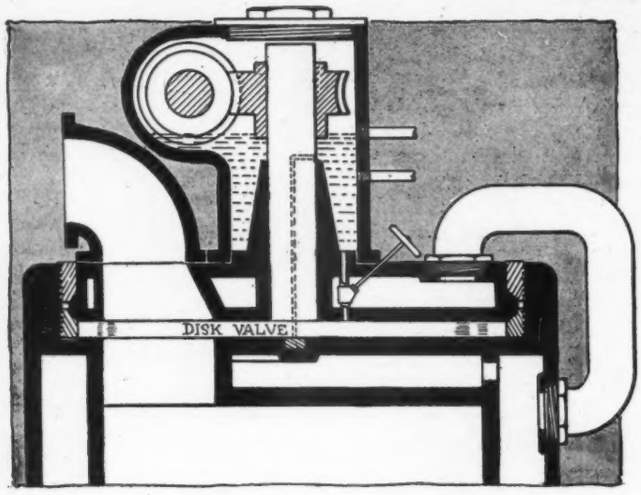

Fig. 3—Section through the disk valve of a Beck motor

an-hour mark the momentum of the car seems to be the greatest factor.

My own idea is that the gasoline which the oil companies are now putting out is inferior or that the gasoline does not vaporize enough. But this cannot be so, as the car works fine on any speed on any gear from 0 up to 30 miles.

It may be the speedometer, which I notice is somewhat worn in the small wheel member meshing with gear attached to wheel. It is rather difficult to tell in driving a car, as I have no chauffeur, whether I am going 30, 40 or 45 miles an hour except by the speedometer.

Albany, N. Y. FRANK DEWITT BROWN.

—You should replace the small gear on the speedometer. These are made softer than the large gear on the wheel so they will wear out first, making the replacement inexpensive. Where you have lost motion in the speedometer gearing it is impossible to tell how fast you are going. With the Maxwell "Special" you should be able to get up to 45 miles an hour without very much trouble. As a matter of fact, after you once start you can run faster on a low-grade fuel than you can on a high grade. There are more heat units in the fuel. Keep the radiator covered in cold weather and see that your carbureter gets plenty of air at high speeds.

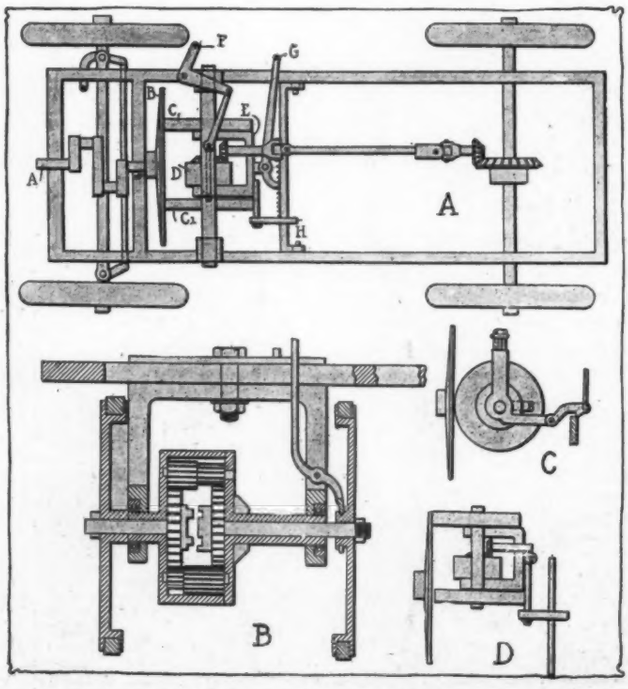

Fig. 4—The Trufant friction drive which has lately been invented

Get in Touch with Manufacturers

Editor THE AUTOMOBILE:—We have a Kelly 3-ton truck equipped with Frayer-Miller fan blower air-cooled motor. It is necessary that we change the power plant to water-cooled, and we wish to hear from engine manufacturers who have no doubt already furnished motors, and also from radiator manufacturers who could furnish either the dash type or the front type radiator.

Of course, we realize that we will have to make some changes in the chassis frame-work in front, and it is our idea to extend same sufficiently to carry the motor under a hood instead of under the seat, as at present. The present subframe for the engine is 19 inches in the clear, and, because of the steering gear and gearshift mechanism at the side, it will not be feasible to widen same over a couple of inches at most. Is this plan practical? E. C. JENKINS.

Cleveland, O.

—The scheme is practical, but when you take it up with the motor manufacturers you will no doubt find that it is expensive.

Questions of Cylinder Design

Editor THE AUTOMOBILE:—I am making drawings for an engine, bore 4.5 inches, stroke 8 inches, compression about 110 or 115 pounds. I would like to know if a .25-inch wall is thick enough to withstand the pressure. The casting being made of finest iron obtainable. I would also like to know if steel could not be used as well as iron for cylinders. Are there any advantages contained in iron which are absent in steel? What is considered the best angle for valve seats on a high speed gas engine?

New York City. F. A. KUPER.

A formula which applies in practice for the thickness of small bore cylinders is as follows:

$$t = D \div 30 + .125 \text{ inch.}$$

—In this formula t, is the thickness; D, the cylinder diameter, and .125 inch is added to make the cylinders thick enough for good shop practice. This would make the cylinder you are designing work out as follows:

$t = 4.5 \div 30 + .125$ inch $= .15 + .125$ inch $= .275$ inch.

A thickness of .275 inch would be plenty, and .25 inch would probably suffice.

Steel castings are not successful in motor cylinders. Steel cut from solid blocks would be too expensive. Therefore steel is not used. The nearest to steel is semi-steel or vanadium iron.

A seat angle of 45 degrees is the most common for poppet valves.

Interested in Beck Motor

Editor THE AUTOMOBILE:—Being a reader of your paper and very much interested in your article on non-poppet valve engines, I would like to ask a few questions on the Beck motor.

In your article you state that the pressure is somewhat removed. Taking for granted that the disk is, say, .001 or .002 smaller than the ported faces, will not the pressure between the faces equal that of the cylinder? Or is it that the speed of a gas engine is so fast as not to allow the pressure to get in such a small space in such a short time?

Taking for granted again that the gases do get there, would they not ignite? Then if they ignite, would that cause a carbon deposit between the ported faces?

New York City. S. E. FAMSON.

—Referring to Fig. 3, which is a reproduction of that given in the issue of December 19, it will be seen that the pressure is only exposed to a small area and therefore the total pressure on the disk is relatively small. The amount of effort required to turn the disk is not at present known, as the motors are now in a more or less experimental stage.

Even if such an explosion occurred it would probably do no harm. The gases probably ignite at the point you mention, but as far as a carbon deposit is concerned it is doubtful if trouble will develop in that direction.

Has Invented Friction Drive

Editor THE AUTOMOBILE:—Not being familiar with any type of friction transmission as used on automobiles, excepting the Cartercar, Lambert, Metz and Patiel, will you kindly describe any other types there may be on the market? The reason I am asking is that I have a model of my own invention in which friction is applied differently and with more efficiency than the above-named.

Windsor, Mo. GEORGE P. JAMES.

—THE AUTOMOBILE has no further list of friction drives. There was one described in the issue of April 25, 1912. It is the invention of W. E. Trufant, who stated in part:

"It is well known that in the usual type of friction drive for automobiles there is difficulty in starting and in running at very slow speed because the velocity of the contacting friction surfaces is so slow. To overcome this, great pressure must be applied and the wear and strain are excessive. When the roll is in the high-speed position and the operator carelessly applies the same pressure as was necessary on low speed the strain, wear and loss of power are very great.

"To overcome all this and get almost unlimited power on the slowest speeds with little strain or wear of the parts two rolls are employed mounted on a yoke one on each side of the center of the disk with a differential gear between them and a bevel gear on the differential case to transmit power to the jackshaft or rear axle. In this construction, when the rolls are an equal distance from the center of the disk there will be a high velocity of the friction surfaces, but no movement transmitted to the differential case as the gears in case are idle because one roll rotates in one direction at the same speed that the other rotates in the opposite direction. Now if the yoke and rolls are moved a little to the right so that one roll will be farther from the center of the disk than the other, you will still have a high velocity of the friction surfaces and a forward movement will be transmitted to the differential case at a speed equal to one-half the difference in the speed of the rolls. When one roll is at the edge of the disk and the other near the center the speed will be nearly one-half the speed of the fastest running roll.

"The reverse is obtained by moving the yoke so that the roll at the left rotates faster than the other and so controls the direction of rotation of the differential case.

"To insure equal pressure on each roll the pressure is applied to the yoke at a point between the rolls, and the yoke is hung on a pivot.

"To get a higher speed forward than the differential motion will allow the differential is locked and one roll held out of contact with the disk.

"On account of the great power at low speeds this drive is particularly adapted to motor trucks.

"In Fig. 4 A is the engine shaft; B the friction disk; C and C1 the rolls; D the differential case, and E is the yoke which carries the rolls; F the lever to move the yoke and rolls along the face of the disk; G the lever to press the rolls against the disk, and H a latch to hold the left-hand roll away from the disk when the differential is locked.

"More of the details showing how simple the construction is are given in Figs B, C and D. As will be noticed in these figures all that is necessary to lock the differential is to move one of the rolls and its shaft axially until the differential gears, engage each other."

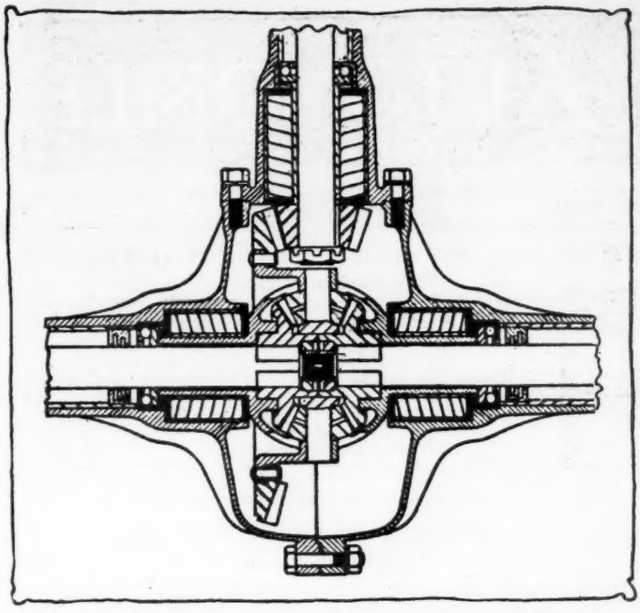

Fig. 5—Rear axle, using nothing but roller bearings with ball thrust

Cleaning Out Old Oil

Editor THE AUTOMOBILE:—I have a splash system for oiling my car. I have drained all oil from crankcase and desire to clean it thoroughly. Some oil will remain in bottom of crankcase where the over supply of oil goes. How can I clean with kerosene without removing lower half of crankcase, and how can I remove all the kerosene.

Anderson, Ind. W. W. ROGERS.

—You do not mention the name of the car you are using so no specific information can be given. Pour 3 quarts of kerosene through the breather pipe. Run motor for 15 seconds. Let stand 24 hours. Open drains in bottom of crankcase and pour in new lubricating oil.

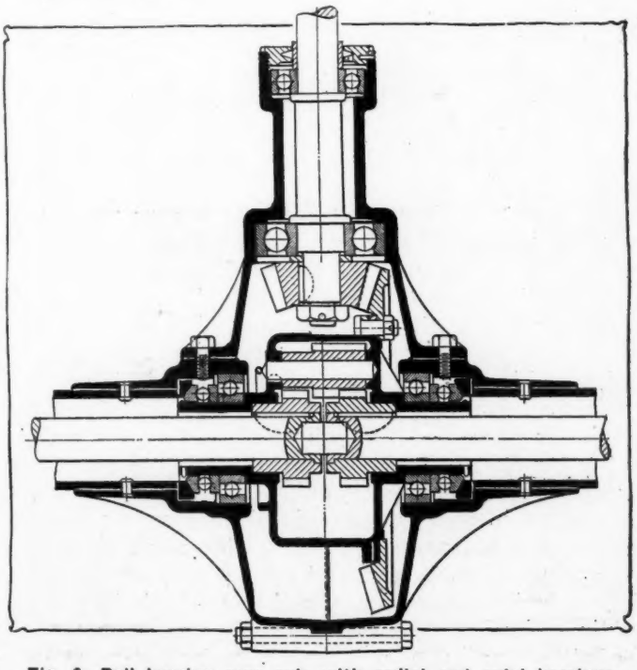

Fig. 6—Ball bearing rear axle with radial and axial bearings

The Editor of this department is holding numerous letters signed Reader, Subscriber and by various initials which cannot be answered until the name of the sender be known. Owing to the large number of inquiries received many letters are answered by mail instead of through these columns; those of general interest being selected for the latter purpose. Anyone may receive a direct reply by mail by stating their desire and enclosing postage.

The AUTOMOBILE

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Entering Wedges

TO the automobile manufacturer the New York shows of 2 weeks ago and the Chicago shows running this week have had a far-reaching value in that the maker has had an opportunity of gauging the public pulse on many of the innovations incorporated in 1913 models, whether these innovations are found in his own car or in those of his rivals. In a word, the maker knows better today where he stands than he did 3 weeks ago. This is a valuable asset. It is imperative to know where you stand, so that if on the right road you can push ahead and if on the wrong road you can retrace and start anew.

To be on the right road does not always mean to be most in accord with the imagined whims of the public, but rather to be on the road along which the saner public demands may be found. This is particularly apparent at the present show. To be explicit: In the matter of cranking motors there are several makers with certain types of cranking motors, which types are hopelessly in the minority so far as public inquiry is concerned, but who believe they are right and are convincing the public that their apparatus is as successful as the more popular types and has certain advantages in spite of some disadvantages. It is always a good balance wheel when some manufacturers have minds of their own and set out valiantly to set their principles graphically and sensibly before the public. More of this individual concern stamina is needed.

The desires of the buyers at Chicago are practically the same as those in New York. Years ago there was an apparent difference between the requirements of the two national shows. In those days the motor-buggy was a Chicago characteristic, the makers of these vehicles imagining that Western roads and Western people demanded such, but the end of them was quicker than the rise, and since those days the cars of Chicago are the same as those of the East, excepting for the larger following of foreign machines in the Eastern metropolis. Three years ago there were over a score of Central West manufacturers who did not show in New York, but presented their wares first at Chicago. Now this is largely changed so that less than a dozen concerns miss the New York show and make their annual bow at the Chicago exposition. On the other hand, there are only about the same number seen at New York who are not exhibiting this week in Chicago. This new order of things is but one more example of the nation-wide influence of the car, which has attained such enormous proportions during the past years; so that today, **whether a car is built in Iowa or Pennsylvania, it is known alike from coast to coast.** This holds true with the exception of half a dozen concerns who operate quite locally and confine themselves largely to special order work. During the last year there has been a steady elimination of those companies that have been entirely local in their operation.

From the general inquiries of the public at the metropolitan shows to date, interest centers around a score of car features. **Everybody wants electric lighting.** So general is the demand that where it is not stock the inquirer not infrequently walks away, a fact which is also true with respect to cranking motors. When cranking motors are inquired about the first questions are for the electric type, but if the concern makes a pneumatic or other type it is generally reported not to be a difficult problem to convince the prospect that the air or mechanical type gives entire satisfaction and generally the salesman does not fail to point out the disadvantages of the rival systems. **The general public generally fails to recognize the differences between the various types of electrics and in scores of cases seem to be as satisfied with one make as with another.** There has not been sufficient educational work on the pros and cons of electric starters.

Salesmen Need Education

It is imperative that foolhardy performances be avoided with electric starters, and in this respect those dealers who are showing how many hours their starter will run the motor continuously and how far the cranking motor will propel the car along the streets with a load of passengers, are working a great injury to the cranking motor business. They are themselves setting a bad example, an example which will be taken up by prospects and made imperative some months hence as a demonstration feature. **Nothing could be more absurd and unnecessary that these foolish performances and equally foolish arguments which the poorly-informed salesmen are putting forth.**

The cranking motor demands educated salesmen and unfortunately at New York City as well as at Chi-

cago many of the salesmen were entirely ignorant of the real features of their equipments. About all they knew was how to operate the cranking motor and they generally were able to say how long it would keep the motor turning over and at what speeds, but they were absolutely inadequate to give that common-sense advice on the use of a cranking motor which the buying public is in such need of today. Cranking motors are here to stay and makers should prepare their salesmen to make the early operation of them as successful and cheap as possible. Unless rational caution is used there will be much battery trouble with many owners, because of the large initial current draw by the cranking motor.

Left Control Is Coming

There are more than a score of other entering wedges in addition to cranking motors and electric lighting: Left-hand location of steering wheels is one, yet it is quite an unsettled question with several makers to date. One of the leading Western distributors handling cars with right-hand wheels claims few if any inquiries for the left-hand wheel, whereas his rival with a right-hand wheel openly announces that he has lost several sales because of not having cars for sale fitted with the left-hand wheel. Like all other new questions there are two sides to it, and while it seems certain that the left-hand wheel is slowly on the gain it will be some time before several concerns adopt it. There are many arguments being cited pro and con on the wheel position and naturally drivers who have been used to the right-side wheel are strongly in favor of it. For city driving there is a more general demand for the left-side wheel, chiefly in large cities where the huge motor truck with its high body is coming into more general use and also where the closed type of passenger car is so general for winter use. Where chauffeurs drive cars the question of right or left-side wheel is not of so much importance.

Wire wheels are going to be a most important 1914 factor. They cannot come in numbers before that date because the makers cannot supply the demand. The old arguments that the public would not take to their appearance have been exploded as have also those of washing, etc.; and now the wise maker is putting forward those important arguments of greater tire wear, increased motor flexibility in driving the car and reduced stress on motor bearings.

The precipitation of carbureter interest brought about by the increased prices in gasoline will have a far-reaching effect before the 1914 models are announced. One leading car company getting but 12 miles per gallon at present has, with a new carbureter design, been able to average over 20 miles to the gallon. Similar reports come from many other concerns. Doubling the fuel mileage will not be general next season; this is too much of a jump and if it is apparently so easily obtained it would have been on hand before this. **There will be greater fuel economy next year, because of improved carbureters and more efficient motors.** The car makers must co-operate with the carbureter makers in bringing this about. Carbureter makers are getting away from moving parts, such as auxiliary air valves in several instances; they are also improving starting by the gasoline bypass from the float chamber to the intake manifold above the throttle, thereby enabling the throttle being closed to start and insuring plenty of fuel through the bypass; and the general use of the hot-air horn, the shutter valve on the air intake and the hot water or air jacketing are most important.

Next year will witness more unit motor and gearbox construction than seen this season. In a few cases this will be at the expense of the unit rear axle and gearbox, because a few concerns with 1914 models at present on the road are contemplating such alterations. With left-hand steering wheel the unit motor and gearbox given ideal arrangements for center levers, a construction which eliminates cross shafts for these levers and keeps them entirely free from the body.

A few concerns, and they are pioneers and leaders, are going to use lighter pistons for 1914. Some are already placing orders for steel pistons and a few are working with magnalium. With steel the weight is cut from 4.5 or 5 pounds to 2.5 or 3 pounds, and this weight reduction shows almost unexpected increases in horsepower, the increases in some dynamometer tests being as high as 45 per cent. Those makers who are planning to use a few of these lighter reciprocating parts are going carefully and have had them under test for several months. The question of clearance is one of the big ones with both steel and magnalium and every caution is needed with either. The more the weight of reciprocating parts can be reduced the better, because vibration is cut down and possible motor speeds increased. **Last year's racing experience aided in showing the increased speeds possible with lighter pistons as well as how it assists in producing a smoother running vehicle.**

Increased Efficiency Now

With motor improvement by way of a more general use of block casting, longer strokes and higher piston speeds in lineal feet and higher crankshaft revolutions with consequent greater motor efficiency, there is a demand for improved lubrication. The adoption of forced feed to the bearings with pressures as high as 40 pounds is exhibiting in leading makes. More oil when needed at the various motor parts is essential because of higher explosive pressures with the higher crankshaft speeds, and not infrequently the reduced waterjacket space between cylinders in block casting makes the demand for more adequate oiling still greater. Foreign makers have discovered that the higher explosive pressures at high speeds call for higher oil pressure to the bearings. Racing has taught them this lesson, in which the oil pressure has been carried to beyond the 200-pound mark with a few makers, and with this really enormous pressure there has been a noticeable loose fitting of the bearings crankshaft, these being so loose as to practically pound on low speeds and idling.

A continuation of several other motor trends is promised in 1914: With six-cylinder motors the use of block and triple castings will increase, the makers already have their plans laid in these respects. Intake manifolds will be abbreviated where either the triple or block casting type is used. The seven-bearing

crankshaft is being weighed very carefully by both European and American builders and the feeling is gaining ground that **four bearings of good length hold the oil film better in these high speed motors than seven shorter bearings.** In this same regard the three-bearing crankshaft for four-cylinder motors gives promise of displacing the five-bearing type. Not a few makers of six-cylinder motors with the long aluminum crankcase have noticed the weaving of the case up and down in the center. This weaving is naturally transmitted to the crankshaft and must impose a strain on it. With the shortening of motors this is being avoided, although some have worked against it with the heavier crankshaft. A few use metal other than aluminum for the top of the crankcase and another solution is casting the cylinders with top of the case integrally, a construction possible with block cylinders. When this is done the separate cylinder head receives attention, it having the merit of affording ready removal of carbon and also allowing the machining of the cylinder head in manufacture as well as making the boring and grinding of the cylinders an easier operation. Next season will witness progress in motor design along these various lines.

The movement started in Europe a few years ago for lighter rear axles is growing. Lighter rear axles means reduction in unsprung weight and consequently longer tire life. The moving of the gearbox from the axle to the motor is one means of accomplishing this and other means are by mounting the springs so that their weight is carried on the frame and not on the axle, and also the mounting of the differential on the car frame and using a combination stationary and live rear axle. The axle housings are being lightened by not a few makers, and there is a tendency to eliminate unnecessarily expensive axle constructions and use more standardized forms. The use of die-cast aluminum for differential housings in the axle has not yet made its appearance in America. Close in touch with improved rear axle design is that of underslinging the rear springs. Where either elliptic or three-quarter elliptic springs are used clipping them beneath the axle gives a lower body carriage.

The more general use of pressure feed for gasoline and the consequent mounting of gasoline tanks on the chassis in rear calls for adequate provisions for supporting the gasoline tanks and those concerns who have redesigned the frame side members to meet the new conditions are accomplishing the neatest jobs. The side members are in such cases curved downwards around the end of the tank providing a neat and most adequate support and one which eliminates the necessity of several additional parts. Some improvements must be made in filling arrangements for these tanks because of the growing practice of carrying the spare tires in the rear of the car. Where wire wheels are used this difficulty is increased. The new conditions will call for a change in position of the filler cap.

Death Takes I. A. Mekeel

Prominent Publisher Dies After an Illness of One Week—Was Connected With Several Prominent Trade Papers

Sterling Qualities of Self-Made Man Won the Esteem of All His Associates

I. A. MEKEEL, vice-president and treasurer of the Textile Publishing Co., publishers of the Dry Goods Economist, died at midnight on Sunday of this week at the East Orange, N. J., home of D. R. Caldwell, president of the Wells-Fargo Express Company. Mr. Mekeel had been stricken just a week previously on the afternoon of January 26 with indigestion so acute as to affect the heart, and had continued in such a condition that he could not be removed to his own home at 80 Upper Mountain avenue, Montclair, N. J. Towards the close of last week his condition showed decided improvement, but on Sunday, the 2d inst., he suffered a relapse and at midnight the end came.

Mr. Mekeel was born in Clinton, Ia., September 25, 1870, the son of George M. and Maria Haviland Mekeel. He was educated at the Friends' Academy at Union Springs, N. Y., and at the age of seventeen became a school teacher in the vicinity of that place. Two years later he removed to St. Louis and connected himself with a brother, the owner of *Mekeel's Weekly Stamp News,* a paper published in the interests of philately. He gave proof of the business ability which afterwards became so marked when, at the age of twenty-one, he went to Europe to effect the sale of rare stamps. Subsequently he became the owner of *Mekeel's Weekly,* which is now published in Boston and in which Mr. Mekeel was interested up to the time of his death.

Mr. Mekeel connected himself with the Textile Publishing Co., in 1900, as a solicitor on the Dry Goods Economist in the New York market. In about a year he was appointed one of the special representatives not only for the *Economist,* but also of its allied papers in the Root Newspaper Association. So successful was he in this work that in 1904 he was elected a director and secretary of the Textile Publishing Company and treasurer and general manager of the R. N. A.

His marked executive abilities and his power of constructive work were particularly displayed in his management of the first convention of the business and editorial staffs of the Root Newspaper Association papers, which was held in Cleveland, O., in June, 1906. This is but one of the many evidences of Mr. Mekeel's ability in creating greater co-operation and broader interchange of ideas among all the various R. N. A. interests.

On May 1, 1911, principally through the work of Mr.

Mekeel, there were brought together, under the name of the United Publishers' Corporation, a large number of prominent business papers, including the *Dry Goods Economist* and its allied publications in the Root Newspaper Association, also *The Iron Age, Iron Age-Hardware, The Metal Worker, The Building Age, The Automobile, The Motor Age, The Automobile Blue Book, The Auto Trade Directory* and *The Commercial Vehicle*. Of this parent corporation Mr. Mekeel became vice-president and treasurer.

He was also president of the Boot and Shoe Recorder Publishing Co. and the Atlantic Printing Co., Boston, and of the Mekeel-Severn-Wylie Co. He was vice-president of the David Williams Co. and of the McGraw Realty Co., and first vice-president of the Federal Printing Co. He was treasurer of the Root Securities Co., the Pacific Coast Publishing Co., the Tri-State Realty Co., and also of the Commercial Bulletin Co., Minneapolis and St. Paul He was also a director of the Dry Goods Reporter Co., Chicago, and of the Dixie Printing Co. and the Tradesmen's Publishing Co., St. Louis. He was a member of the Lotus and Engineers Clubs and of the Aldine Club.

Mr. Mekeel married on October 29, 1896, Elizabeth M. Schureman, a member of a prominent St. Louis family. He is survived by Mrs. Mekeel and three young sons, by his aged father and by his two brothers, of whom the younger, G. D. Mekeel is president of the Commercial Bulletin Co., publishers of the *Twin City Commercial Bulletin*.

Mr. Mekeel's sudden death, in the prime of life and when he seemed to be at the zenith of his powers, is sincerely mourned by a great number of business and social friends. He was well known in many centers other than New York and St. Louis, among these being Boston, Chicago, Minneapolis and St. Paul, and wherever known he was both admired and respected. Of splendid physique, highly attractive personality and apparently unbounded vigor and energy, he at once won all with whom he came into contact. His shrewd business sense, though always at his command, never warped nor unduly influenced his mental breadth or lessened his sterling qualities, derived from a Quaker ancestry. He was a magnificent example of the highest American type of the present day—full of life, of humor, of comradeship, and yet ever intent on the interests of the great business to which he had dedicated his career and in behalf of which he spent himself with all too great devotion and utmost self-sacrifice.

To his immediate associates his death is a shock whose force cannot be put into words, all the more so because hope of his recovery was high and until near the end there seemed no ground for serious alarm. His activity, his optimism, his sound yet prompt judgment, his invariable good humor and the dynamic force with which he put through important matters will be sadly missed. He was a twentieth-century man in every sense of the word. Had he been spared it is hard to say what heights of efficiency he would not have scaled.

But he was more than all this; he was honest, clean-minded, upright; he took no unfair advantage.

To all of his immediate business associates he was more than a fellow-worker. To have known him, to have worked with him, but to have had him as a friend is more. And it is as a friend, a loved and valued friend, that his associates most deeply mourn him.

Albany Legislature Busy

At Meeting of Club Representatives and Owners Opposition to Rigid Laws Shown—Need for Innovations

General Licensing of Automobile Operators Proposed and Opposed by Clubs

ALBANY, N. Y., Feb. 5—(*Special Telegram*)—At a meeting called in by the Secretary of State Mitchell May, to which automobile owners and representatives of clubs and associations were invited, a fairly general opposition to the changes proposed for the safety of the pedestrian public was expressed.

Secretary May, impressed by the insufficient protection given by the apparently effective Callan law, had called in the meeting to discuss the questions of general licensing of automobile operators, including owners and their family members, after an examination demonstrating that the individuals in question were fit to drive an automobile. This sane proposal, however, which has been successfully introduced in a number of European countries, was opposed by most of the automobilists present. While several owners remarked that it would be just to license owners and their sons, to forbid the driving of cars by people less than 21 years of age and such whose eyesight were bad, other owners were emphatic in stating that the present laws, not only of New York state, but also of other states were more than adequate.

A letter, addressed to Secretary May by the New York City Coroner, George P. Le Brun, which brings out some very interesting facts, follows, in extract:

There were 234 fatal accidents in New York City during 1912, being an increase of 40 per cent. over 1911. This increase indicates necessity amendments to the present law governing the operation of automobiles.

Of the 234 fatal cases, forty-three were caused by automobile trucks; five by taxicabs; three by hospital motor ambulances, leaving 182 by pleasure cars. As far as could be learned about twenty-five of these cars were operated by owners, and the balance, 157, by licensed chauffeurs.

Investigation into the cause of these accidents made by the Coroner's office revealed that 75 per cent. occurred at or near street corners, that the cars were going at from the rate of 25 to 50 miles an hour, and operated by experienced chauffeurs. Therefore, in my opinion, excessive speed in operating automobiles in the City of New York is the cause of the majority of accidents, and the fact that there seems to be no punishment for running over pedestrians; as of the 234 fatal cases, I am not aware of an operator being sent to jail, fined or punished in any way. This is well known among operators of cars, as in the majority of cases they are not even arrested. The records last year show but 30 per cent. of arrests in fatal cases. Naturally they become careless and disregard the rights of pedestrians. I believe the revocation of the license would be the means of making the operator of a car more careful, and the suspension of the car license for a stated period when it was operated by the owner, or when he was in the car with the chauffeur at the time the law was violated.

I would suggest another means to avoid accident and that is an ordinance prohibiting pedestrians from crossing busy streets other than at crossings.

All operators of cars should be licensed and no license issued without the applicant being examined as to his fitness to operate a car.

In every runover the police should notify the Secretary of State, who should have the power to suspend operators' licenses pending an investigation, and if after an investigation it is shown that the operator violated the law by excessive speeding or otherwise in causing the accident, the license should be forfeited.

As to speed limit in the City of New York, it should not exceed fifteen miles an hour.

The coroner's office has been vigorously opposed to the lax automobile law and the apparent inefficiency of previous legislation. The letter was provocative of much comment.

Blackman with Commercial Vehicle

Charles W. Blackman, who has been identified for several years with manufacturing enterprises of the automobile industry, has become connected with the *Commercial Vehicle*, and has accepted the post of general manager of that publication, which had formerly been held by Robert Wolfers. Besides the experience gained in the practical field of manufacture, Mr. Blackman has accumulated such as his long previous connection with automobile publication could bring him. Besides attending to the general management of the publication named above, Mr. Blackman will supervise the policy of the paper.

Four New Manufacturers at Detroit Exhibition

Forty-Two Makes of Pleasure Cars Totaling 300 Exhibits on View—Good Attendance

Philadelphia Closes Successful Pleasure Car Show—Will Now Show Trucks—56,000 See Buffalo Show

DETROIT, MICH., Feb. 3—Detroit's twelfth annual automobile show closed its doors on February 1, after having submitted to the people of Michigan a representative array of makes of pleasure cars, electric and commercial vehicles. In addition to the Wayne pavilion the large number of exhibitors made necessary the use of the Annex this year. This will probably remain one of the city's show buildings. It is 173 by 124 feet across Front street from the main building and gave the exhibit 10,000 more feet of floor space than could be boasted of in 1912.

Forty-two makes of pleasure cars were exhibited, each manufacturer showing several models, thus bringing the total number of show cars to something like 300. The show marks the entry of Detroit into the national show circuit, which now, in addition to Detroit, comprises eleven large cities. For this reason many of the exhbits were brought direct from the New York exhibition.

Four new cars made their first bow at the Detroit show. These were the Traveler pleasure car and the Hercules, Standard and Star commercials.

The Traveler is the product of the Traveler Motor Car Company, Detroit. It is an assembling proposition and features the Traveler-Detroit 36 at $1,080, fully equipped. The specifications include left-hand drive, center control; wheelbase, 120 inches; Beaver motor, 3 3-4 x 5; unit power plant; cylinders cast in pairs; multiple disk clutch; chrome nickel gears, selective sliding gear transmission; semi-elliptic springs, front and three-quarters elliptic rear; Timken axles, full floating rear axle; 34 x 4 Goodyear tires, non-skid all around; Bosch dual ignition; Gray & Davis lighting system; 18-gallon gasoline tank, and full electric equipment.

The Star truck is made by the Star Motor Car Company, of Ann Arbor, Mich., which has succeeded the Huron River Manufacturing Company, of Ann Arbor. Standard parts are used, the body being built at the factory on orders from the purchaser. This new Star line is made in two types, model A being a 1-ton proposition, while model B has a rated capacity of 1,500 pounds. Continental motors are used, the model A having a bore of 4 1-8 inches and a stroke of 5 1-4 inches. The other model has a motor of dimensions of 3 3-4 by 5 1-4 inches. The cylinders of the latter are cast in pairs while those of the former are monoblock-cast. For the type A chassis with 130 inches wheelbase, $1,800 is asked, while type B is priced at $1,200. The wheelbase of this model is 110 inches. The two machines are conventional in most respects and reflect standard practice as it applies to commercial car construction.

The Standard truck, made by the Standard Motor Truck Company, of Detroit, is in four lengths of wheelbase, twelve lengths of frame back of seat for loading space. Eight different gear ratios are available between motor and rear wheel, permitting gearing the truck to suit the services to which it is to be used. The chassis is a complete unit, including seat, to which any type of body may be attached. The short chassis has 10 feet wheelbase, the standard has 12 feet wheelbase, the long 14 feet, and the extra long 16 feet. The Standard chassis is $2,750 and the others $50 additional. The car has a four-cylinder Continental motor, L-head type, 4 1-2-inch bore, 5 1-2-inch stroke, and has 40 horsepower. It has a capacity of 3 tons and sells for $2,750.

The Hercules 1-ton truck, manufactured by the Alma Manufacturing Company, of Alma, Mich., is made in two types, one with engine under hood and the other with engine under seat. Following are some of the specifications for engine-under-hood type:

Loading capacity, 2,000 pounds; speed, maximum 15 miles per hour; Continental 30-horsepower motor, four-cylinder, L-head type; 3 3-4-inch bore, 5 1-4-inch stroke; carbureter, Schebler model L; ignition, Bosch magneto, set spark.

The price of this Hercules, including standard equipment and stake or express body, is $1,775.

Quakers Saw 80 Motor Trucks

PHILADELPHIA, PA., Jan. 31—Philadelphia's twelfth annual automobile show, conducted under the auspices of the Philadelphia Automobile Trade Association, came to a close tonight. Staged in the new mammoth garage of the Automobile Club of Philadelphia, Twenty-third and Market streets, the exhibition of gasoline and electric pleasure cars and commercial vehicles was the most successful, financially and socially, ever held in this city.

All told, some 300 cars were shown during the first week, which was devoted solely to pleasure cars, consisting of sixty-nine different makes. Part II, or the commercial vehicle section, which wound up the show tonight, consisted of about eighty motor trucks, the product of thirty-five manufacturers, the exhibits ranging in size from 500 pounds' capacity to 10 tons, and showing bodies adaptable to every conceivable form of transportation. Some were entire strangers to Philadelphians, notably the Velie, Blair and Smith-Milwaukee, which were not installed until Tuesday.

The commercial vehicle exhibit this week, together with the hold-over accessories dealers, occupied two floors. Although a representative display was presented when Part II opened on Monday, it was not until Tuesday that the show got under way and was filled with spectators.

Buffalo Show Successful

BUFFALO, N. Y., Feb. 4—With an average daily attendance of 8,000 people, Buffalo's eleventh annual motor show came to a close Saturday night. In point of sales and attendance the exhibition just closed proved the greatest in local automobile history. In fact local motorists say it would be hard to duplicate. Thursday night broke the record for attendance during the week. The night was "Society" night, and fully 12,000 people were present. The lowest attendance of the week was registered on the closing day when 5,000 were present. The door prize, an Empire touring car, was won by A. G. Mead.

View of Wayne Pavilion, Detroit, showing exhibits in place before opening night

Metropolitan Engineers Discuss Motor Testing

Various Types of Brake Testing Mechanism and Manograph Work Discussed Informally

Hugo Gibson Presents Paper on Manograph and Dwells on Its Operation—Montreal Show Closes

TWO papers were on the schedule for the January meeting of the metropolitan section of the Society of Automobile Engineers, held last Thursday evening. The first of these papers was by Herbert Chase, of the testing laboratory of the Automobile Club of America, entitled Motor and Carbureter Testing. The second was by Hugo Gibson on the Manograph. Both papers were illustrated by lantern slides and the discussion was taken by dictaphone.

A running discussion was carried on while Herbert Chase showed his slides on the various kinds of apparatus used in testing work. Slide 1 depicted the Brony brake and the rope form of brake. The principles of resistance upon which all brakes work was discussed. The rope brake was criticised owing to the fact that it had a marked tendency to seize and also because of the difficulty in regulating the load. The fan dynamometer was also shown on this slide and various methods of changing the load suggested. It was brought out, however, that owing to the difficulty in correctly calibrating for all conditions, inaccuracies were bound to creep in.

Slides 2 and 3 showed further particulars of the rope brake and water brake. The small size required for the absorption of a given amount of power is one of the advantages of the latter type of brake. The fourth slide showed the Garland brake, which has recently come into prominence for automobile motor testing. Briefly, this device works upon the principle of an increased load through the means of an increased electric field resistance due to the cutting of magnetic flux by copper. The brake is cooled by water without the use of any piping connections. At 3.5 amperes a load of 100 horsepower is held at 2,000 revolutions per minute.

The fifth slide showed the electric cradle type of brake. This was stated by Mr. Chase to be expensive but ideal. It is small for the amount of power consumed, it is accurate and can be used for the measurement of power of fractional loss.

The next series of curves touched upon the results secured by exhaust gas analysis. Mr. Chase stated that it was evident if both CO (carbon monoxide) and free oxygen were present in the exhaust gas that combustion had not been complete and that a percentage of the fuel was being thrown away in the exhaust instead of being of use for propelling the vehicle. The correct proportion of air to gas for forming a mixture which showed the best results as far as combustion went was stated to be in the neighborhood of 12.5 parts of air by weight to one of gasoline. The results in this case gave no carbon monoxide and a maximum of CO_2 (carbon dioxide). This meant that all the carbon on the charge had been burnt and the highest possible efficiency secured from the fuel.

The losses of heat in exhaust temperature and through the cooling water, it was stated, were unavoidable. It was shown that the losses through the cooling water on an average motor were about 30 per cent. of the total power in the fuel put into the motor. This could not be cut down with our present methods of cooling, Mr. Chase stated, and was to be expected.

Some typical manograph cards were thrown upon the screen. The effect of late and early ignition was noted. Some discussion regarding the waves often found in the expansion line ensued. It was the theory of some of the members that this was due to stratification of the charge. Others stated that they had noted the fluctuations in the curve whenever the motor was operated with too rich a mixture. Following the discussion on the manograph cards a description of the testing apparatus at the Automobile Club of America was given.

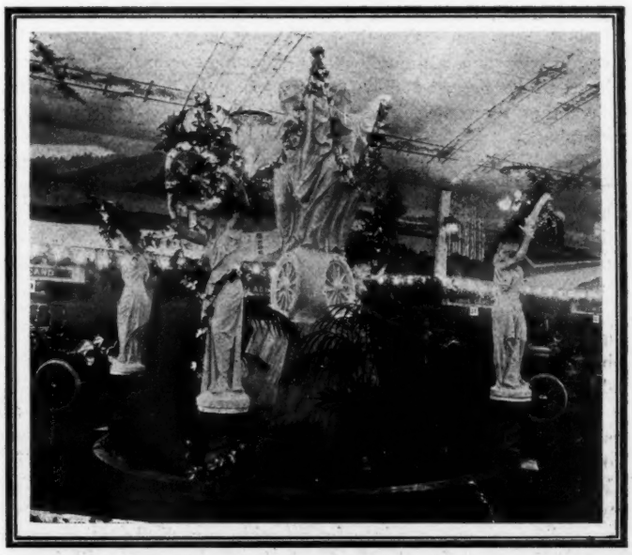
After a short recess Hugo Gibson's paper on the manograph was given. He spoke on the rapidity at which the beam of reflected light crossed over the ground glass. He spoke of the light weight of the moving parts in the manograph and the fact that there was no lag to the beam of light which was large enough to be appreciable. The total weight of the moving parts in the manograph as he used it measured 3.5 grams.

A discussion on the diaphragm showed that it generally lost some of its resiliency after it had been in use for some time. This necessitated a recalibration of the instrument in order to take care of the change in the diagram due to the change in resiliency of the diaphragm. It was brought out, however, that the change in the resiliency was so slight that the recalibration showed very little change over the former readings.

The necessity of using a pressure pipe at all was regretted by Mr. Gibson. He stated that a certain loss resulted which would not be the case if the diaphragm could be part of the cylinder wall. This was found to be impossible owing to heat and other conditions under which the diaphragm would be compelled to work. He also stated that the same manograph should be used for each cylinder where the diagrams were taken of a six-cylinder motor. If different manographs were used for each cylinder the curves would be on a different basis and would be hard to compare. For this reason he used a series of water-cooled cocks which could be employed to connect each cylinder with the manograph in turn. It was shown also in Mr. Gibson's discussion of the manograph that the arc light is a necessity; for, as he stated, the time of each exposure is only .000,004 second and the acetylene light is not powerful enough for this work.

Montreal Has 178 Exhibitors

MONTREAL, Feb. 2—The second automobile show was successfully brought to a close February 1. There were 178 automobiles and trucks in the exhibition. Of these, 124 were touring cars, and 51 delivery trucks. The total sales and prospective sales were much greater than ever before. Undoubtedly the show was a monster success from every point of view.



Part of the elaborate decorations of Detroit's Twelfth Annual Automobile Show

East aisle of Coliseum looking northeast

(*Continued from page 403.*)

cups with long tubes attached so that the cup can be accessibly mounted, the tube leading the grease or oil to the part to be lubricated. These improvements are generally on the higher-priced machines, those driven by chauffeurs, so that those driven by owners, are poorly provided for in this respect.

During the opening evening of the show one salesman in conversation with a group of prospectives was heard to remark, "We cannot get our owners to even fill the grease cups and we have to inspect many of our cars periodically to insure that they are cared for." A hurried glance at the chassis, which this salesman was representing, showed that not a solitary one of the rear axle grease cups could be reached without getting under the car and lying on your back on the ground. Is there any wonder that with such lack of accessibility that owners do not give attention to such parts? There is more injury done by failure to fill grease cups and give the parts supposed to be protected by them proper attention than there is by such parts wearing out.

At the exhibit space of another concern, which makes a speciality of having accessible grease cups, it was learned that grease cups on universal joints had to be taken off and new types of joints fitted, because the destruction of the joints was due to lack of attention rather than to normal wear. These are actual conditions, and although many salesmen remark, "They only have to be screwed down every 500 miles," yet the engineer says that they should receive attention after every century of running.

The difficulty of caring for rear axle grease cups has increased with the placing of gasoline tanks under the rear of the chassis, and still more so by carrying tire and demountable wheels on the rear, but in spite of these changes there has not, in scores of cases, been any attempt to add to the accessibility of these important parts of the car.

The use of flexible tubing in connection with grease cups is gaining more prominence, and by its use grease cups can be brought out to some accessible position. Much more can be done in this respect, and there is great need for it.

Several examples of accessibility of lubrication measures are seen and any cited herewith are cited merely as examples, and others could be cited as fulfilling the same requirements. The Haynes motor carries a large filler pipe with a funnel ending, which funnel is carried high up and well out, leaving it entirely accessible and yet not interfering with any of the other motor appurtenances. On the Packard the brake rocker shaft, carried in front of the rear axle, is lubricated by a grease cup carried back of the axle and fitted with a long tubular stem reaching to the rocker shaft bearing. On the Stevens-Duryea six a long vertical pipe is fitted to one of the rear axle brake oilers, solely to bring the oiler head to a position where it can be filled with entire ease. On the Peerless chassis is a similar provision. The Premier chassis uses a very large grease cup at the forward end of the torque tube and this grease cup inclines forward so as to be reached when the floor boards are raised. On the Cadillac the grease cup for the forward end of each rear spring is a long stem allowing the grease cup to hang much lower than the spring eye and so make it accessible from underneath the fender. On the White motors exceptionally large filler caps are used on the motor oil reservoirs so as to make filling easy. The fan and water pump shafts also carry large grease cups. On the Locomobile chassis the differential portion of the axle is entirely free from grease cups, which gets away entirely from the inaccessible feature.

An improvement that can be imitated to advantage is that of fitting leather boots for the steering connections between the cross tie rod and the steering knuckle parts and having the grease cups extend through these boots so that the screwing down or filling of these is not molested and is the same whether the boot is in place or not.

One of the most inaccessible grease cups is that on the clutch cone, and yet it is one that merits every attention. From factory representatives it was generally learned that it is frequently neglected, yet it is on a rapidly rotating part and should receive the major share of attention. The clutch thrust collar can be lubricated by a grease cup located on the outside of the chassis frame and connecting with the collar through a flexible tubing. This construction could be well imitated by not a few makers.

One of the most inaccessible grease cups is that on the forward end of the torque rod or torque tube, as the case may be. This location generally comes underneath the front seat, a point inaccessible when the forward floor boards are raised and nearly as inaccessible when the tonneau floor is raised. There is not any reason why a long flexible tube could not be connected to this grease cup and the cup placed to be reached from under the forward floor boards.

As soon as designers have decided on what type of generator they will use for electric lighting and what form of cranking motor will be used, it will be imperative for them to set about arranging the various motor appurtenances such as magneto, carbureter, water pump, electric generator, tire pump and cranking motor with some form of symmetry, and so get away from the mussed up appearances that so many carry today. Since the New York show the new Mitchell chassis has been cleaned up considerably in this respect, in that now the lighting generator is located at the right side of the gear-box and the cranking motor at the left side, both specially accessible by raising the floor boards. This arrangement, coupled with the use of a transverse shaft at the forward end of the motor driving the magneto at one end and the water pump at the other, gives one of the cleanest and most accessible outfits seen. It leaves both sides of the motor clean, the carbureter occupying one side and the other side having but the exhaust manifold.

The coming of wire wheels for this season and next will necessitate some changes in fender design, because the conventional falt-top fender, so well suitaed for the straight spoke artillery wood wheel, is not best suited for the wire wheel, when appearances are considered. The convex top lends itself more to the irregular shape of the wire wheel, particularly the coned appearance caused by the radiating spokes meeting the hub end.

Taft Opens Washington Show

WASHINGTON, D. C., Feb. 4—President Taft last night officially opened the Washington, D. C., automobile show by pressing a button at the White House that turned on lights in Convention Hall and unfurled a big flag. This is the first time in history a President of the United States has opened an automobile show. There are forty six exhibitors.

French Grand Prix May Be a Two-Day Event

On July 12 Will Be the Big Car Race Under the Fuel Limitation Rules of 14.1 Miles to the Gallon

Motorcycles and Cyclecars Will Feature the Second Day's Races With the Course Shortened to 12 Miles

PARIS, Jan. 24—It has been practically decided that the Grand Prix race at Amiens next July will be a 2-day event. On Saturday, July 12, there will be the big car race under the fuel limitation rules calling for 14.1 miles to the gallon, and on the following day a race will be held for motorcycles and cyclecars (machines with a cylinder capacity of not more than 67 cubic inches and a maximum weight of 672 pounds). For the small cars the course will be shortened to about 12 miles instead of 19, thus avoiding two of the right-angle turns which must necessarily be cut up after the passage of the high-speed racers. The same grandstands and pits will be used for both events and the cement surfaced hairpin turn in front of the grandstands will also be used by the motorcycles and sidecars.

Several of the French Grand Prix racers will go on the road next month. Delage has already completed the bench tests of his motors, the dimensions of which are 4 by 7 inches bore and stroke. These two cars will be driven by Bablot, the winner of the 3-liter race for Delage in 1910, and by Albert Guyot, who is scheduled to drive the record breaking six-cylinder Sunbeam at Indianapolis next May. Guyot has made arrangements by which he can drive in the American classics on the English car and get home in time to handle the French car on the Amiens course. Peugeot will have Boillot, Goux and Zuccarelli as their drivers. The new racing motors are well advanced, but all particulars of them are being kept secret. It is believed that their bore and stroke will approximate 4 by 7. Sunbeam is at present making experiments with two different types of motors, one set being of small size and running at a high speed, and the second set having a big cylinder area and running comparatively slowly. The Sunbeam drivers will be Victor Rigal, the winner in the 3-liter class at Dieppe last year; Darius Resta, Gustave Caillois, and W. Lee-Guinness, brother of the owner of the famous 200-horsepower Darracq of Florida fame. Christiaens will handle a six-cylinder Excelsior in the French race, this doubtless being the only six-cylinder car taking part. Champoiseau will be one of the Schneider drivers. No other drivers have yet been appointed. As several of the French cracks, among them Duray, Wagner and Hemery, are still without engagements, it is probable that they will be secured for the foreign cars entered in the race.

Seek to Offer Trophies at Indianapolis

INDIANAPOLIS, IND., Feb. 3—The management of the Indianapolis Motor Speedway is trying to arrange to offer the Remy Brassard, the Prest-O-Lite trophy and the Wheeler and Schebler cup in connection with the 500-mile race to be given at the local speedway, May 30. These would be given in addition to the cash prizes aggregating $50,000 which are to be hung up.

It is proposed that the Remy Brassard, which carries with it a weekly salary of $75 a week shall go to the driver making the best time for the first 100 miles; the Prest-O-Lite trophy, which is a brick of silver valued at $1,500 to the driver making the best time for the first 200 miles and that the $10,000 Wheeler and Schebler cup shall be given to the driver making the best time for 300 miles.

It is thought that the offering of these trophies might have the effect of forcing the National and Marmon companies into the race. The Prest-O-Lite trophy was won by Howard Wilcox driving a National and the Wheeler and Schebler cup by Ray Harroun, driving a Marmon. An effort is being made to find a suitable trophy to be hung up for the driver making the best time for 400 miles. Bob Burman has held the Remy Brassard most of the time since it was first offered, and he has already entered the coming race.

The management expects an excellent list of entries, many prominent firms stating that they will enter.

Chandler Motor Car Company Its Name

CHICAGO, Feb. 4—The Chandler six makes its debut during the Chicago show. It was not in the show proper but is being displayed in a private garage to agents who are looking into its merits. The Chandler six is the product of the newly formed Chandler Motor Car Company, which is made up of former officials of the Lozier company. During the New York show it was reported that the concern was to be known as the Emise Motor Car Company, and that it would build the Emise six. Instead of that, it is named in honor of F. C. Chandler, former vice-president and general manager of the Lozier Motor Company, now president of the Chandler company.

Other officials include C. A. Emise, former sales manager of the Lozier, as vice-president and sales manager; Samuel Regar, former Lozier treasurer, as treasurer; W. S. M. Mead, secretary; J. V. Whitbeck, engineer and J. R. Hall, superintendent. The company is capitalized at $250,000 and incorporated under the laws of Ohio. A definite location has not yet been secured but a Cleveland proposition is being considered.

Mr. Emise's resignation from the Lozier company has just gone into effect, and Mr. Chandler and Mr. Regar state they retired several months ago.

It is planned to turn out 2,000 cars the first year. The new model is to list under $2,000 and its specifications include a six-cylinder motor, 3 3-8 by 5 inches, of the L-head type and cast in two blocks. The camshaft, pump and magneto are driven by inclosed silent chains and the valves are inclosed. A Bosch high-tension magneto is used and the cooling is by centrifugal pump, a square-tube radiator being fitted. A Westinghouse electric self-starter and lighting system are used. The clutch is a multiple disk and the gearset three-speed selective in unit with the motor and clutch. There is a floating rear axle, double internal expanding brakes, three-quarter elliptic rear springs, 34 by 4-inch wheels, left side drive and center control, while the car is fully equipped.

A view towards northeast corner of Coliseum

Floating Types Dominate Axle Field

Few Alterations of Any Consequence Made in the Rear Axles Offered to the Car Builder This Year—Quest for Silent-Running Gears

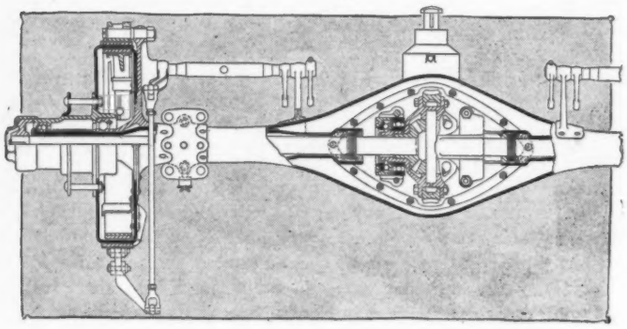


Fig. 1—Showing the general construction of the American worm-drive axle. In the design here shown the worm is carried below the wheel

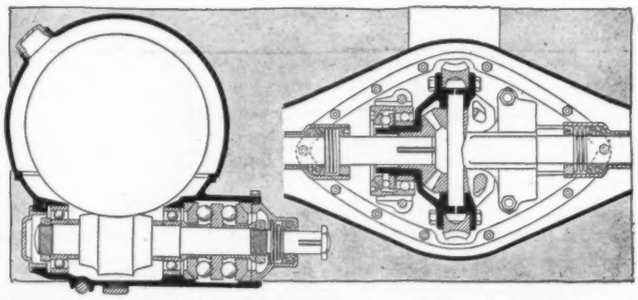


Fig. 2—Details of the mounting of the gears and differential of American Ball Bearing Company's underneath worm-drive axle

AXLE design and construction has been developed to such a degree that this part of the automobile now admits of but very little variation from year to year. Accordingly, in looking over the profusion of designs offered to the motor car manufacturer this year, we see but slight changes, if any at all, from that practice which is now regarded as standard. Nor should we look for radical alterations in products such as this which have gone through such a long process of evolution.

Here and there a manufacturer has added another size or two or another type to fill up gaps in his line, while several others have brought out worm-driven types in anticipation of a demand for them in the near future. Not a few of these makers believe that the public will soon demand worm drives just as it has dictated other changes.

Axle makers as a whole have sought to produce silent running gears, and methods of gear manufacture have necessarily been improved therefor. Pressed steel housings are well nigh universal now in pleasure car axles, these housings being made strong enough so that truss rods have been quite generally discarded. Changes if any have been in the nature of minor refinements, generally not coming to light except on close inspection. Oil packing rings tending to prevent oil leaking, adjustment features, and so on, have in some instances been slightly modified. Metals used for the manufacture of certain parts have in some instances been altered in composition. In other cases entirely different metals are now used for some of the parts.

Floating types are in evidence in nearly every pleasure car axle maker's list, although the semi-floating designs still hold their own for small car installations. Strictly speaking, the majority of floating axles really involve a feature of the semi-floating class in that their driving shafts bolt directly to the wheels through flanges or plates which are integral with the axle shafts.

American—Besides its bevel gear rear axles, which are of the floating type, the American Ball Bearing Company is manufacturing a floating worm-driven rear axle for gasoline pleasure cars, commercial cars and electric vehicles. This axle embodies the Lanchester-Daimler type of worm gear mechanism, the worm being of the hourglass type and partially embracing the circumference of the worm wheel. Considerable difference of opinion exists among automobile engineers as to the relative advantages of mounting the worm above or below the axle and for this reason the American company constructs these axles with the worm in either position.

Drawings showing the construction of this axle for pleasure car work with the worm below are reproduced in Figs. 1 and 2, the details of the mounting of the gears and of the differential are shown in Fig. 2. The housing is of pressed steel, 3-16 inch thick, while the entire driving mechanism, including the worm and worm wheel, together with the differential and all necessary bearings, is mounted on the gear carrier and inserted in the axle as a unit. This construction is also true of the bevel gear axles of this make. The drive shafts and the differential are carried on large annular ball bearings, while ample provision is made for end thrust through the use of thrust bearings at either side of the differential cage. The worm is carried on two annular ball bearings and it is also provided with a double thrust bearing. Provision for oiling is made through the tap hole at the top of the housing. To prevent oil leakage out of the housing, packing rings are fitted. These are held tight against the shoulders of the housing by springs, the tension in which may be adjusted by the nuts shown. The hubs, which are mounted on annulars, are driven through plates on the axle shafts.

Double internal, or external and internal, brakes are supplied. The axle tubes are riveted into the ends of the housing, and like the differential bevel gears are constructed of 3½ percent nickel steel. Drive and axle shafts are made of chrome vanadium steel. Hubs are cast steel, while brake drums and flanges are sheet steel.

Driggs-Seabury—The Driggs-Seabury Ordinance Corporation makes two designs of floating pleasure car rear axles in addition to its front axles. These rear axles consist of a type for cars weighing from 2500 to 3500 pounds and another for vehicles between the weights of 2700 and 3400 pounds. The first is constructed with driving flanges integral with the axle shafts. The housing of the differential gears and bevels is integral with the tubes which inclose the axle shafts, it being made of hydraulically pressed steel. A strong construction is obtained by the re-enforcing of the ends of the axle tubes by wrought steel members which carry the spring seats and the load. The differential unit and its cage are assembled within the housing through a suitable opening at the front, it then being securely fastened in place. At the rear there is a similar opening through which the differential mechanism and driving gears, together with

bearings, may be removed without the dismounting of the rear wheels, the axle shafts being the only other portion of the axle which must be disturbed. With this type of axle, a torsion tube is provided which houses the propeller shaft. Throughout the axle suitable annular ball bearings and ball thrust bearings are used. The 2700 to 3400 pound design differs somewhat from the type mentioned above. The jaw clutches on the ends of the axle shafts are not secured to the hub flanges, while double row ball bearings carry the wheels. Throughout this design, double row annulars are used in place of the single row construction of the other type.

All brake operating rods and levers are located within the overall length of the axle, so that brake connections may all be made within the chassis frame. The operative parts of the brakes can be arranged along their shafts in practically any desired positions to meet the demands of any particular car design.

Hess—The Hess Spring and Axle Company's standard bevel gear drive rear axles are constructed in two sizes, a heavy type and one of lighter design. These are of the floating variety, the axle tubes being integrally constructed with the housings which inclose the differential and driving units. The wheel carriers of model 211 are constructed of nickel steel. Housings are strongly constructed of pressed steel, and the design is such that no truss rod is necessary for cars up to 4500 pounds empty weight. An opening at the rear permits of easy access to all internal mechanism. In this plate there is a tapped hole through which grease may be put into the gearing and bearings. In assembling the axle, the power transmitting unit containing the differential carrier and the pinion is put in through a suitable opening at the front of the housing. The entire driving unit, which is completely assembled before being put in the housing, is carried in hangers, which are integral with the front plate covering the front opening. The light type model 112 axle is especially adapted to electrics and to cars weighing empty up to 2750 pounds. The same general design characteristics hold for this axle as for model 211, except that the axle shafts have integral flanges which bolt to the hubs and that the wheel carriers and housing are pressed out integrally.

Fig. 3 gives an idea of the details of the worm-driven axle which is being produced by the Hess concern in addition to its bevel gear types. This is of the overhead worm design, and a notable feature is the construction of the pressed steel housing, which is so made that a liberal quantity of oil can be carried within it without any escaping. The worm used is of the straight type, better known as the David-Brown type, produced for the Hess Company by Brown & Sharpe. The housing will carry cars up to 4000 pounds empty weight without truss rods. The same general features are embodied in these worm axles as are used in the bevel types, and they are furnished with gear ratios ranging from 3 to 5 to 1.

Lewis—The Lewis Spring & Axle Company is on the market with a floating type of rear axle which is constructed of rolled steel in two halves, which are welded together. The axle tubes are an integral part of the differential housing. Like several other designs, the Lewis axle has its differential gears, bevel pinion and driving mechanism, together with bearings carrying these parts, mounted on a carrier on which all adjustments are provided. Thus if necessary to remove the entire assembly, the adjustments need not be disturbed. The gear carrier is made of cast steel, while the shafts and gears are constructed of heat treated 3 1-2 per cent. nickel steel. The tubes carrying the wheels are separate from the main housing and are carried back to within an inch of the differential cage. These reinforcing tubes are carried on plates and welded to the main housing so that the complete construction is practically a one-piece design.

McCue—The McCue Company offers a complete line of rear axles to meet the requirements of all weights of cars. There are six types of these McCues, one of which, model 7XW, is shown in Fig. 5. This particular type is equipped for wire wheels, the McCue company making a specialty of wire wheel constructions. In addition to the design here shown, the list includes models 6X, 9X, 29X, 17X and 19X, all of which are of the floating type, bevel geared. The axle housings are made of steel in one-piece construction, the metal tapering in thickness from 3-16 inch at the center to 5-16 inch at the ends. The shape of the housing is such that it is a truss within itself, no rods being employed. The wheel bearings are of ample sized annular type, mounted in the center of the wheel hub so as to be in direct line of the force. Driving flanges are fastened to the hubs by six 9-16 inch bolts each. Brakes are both expanding as shown in the figure. The drum diameters of this 7XW type are 10 inches for the emergency and 14 inches for the service brake. Spring seats are made adjustable from 35 to 42 inches center to center. Driving gears and differential mechanism are carried in a unit, bolting to the housing through flange at the forward end. Any of these McCue models is furnished to take either wire or wood wheels.

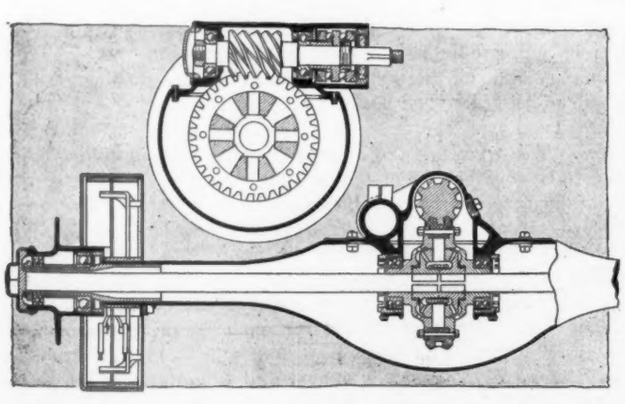


Fig. 3—Hess overhead worm-drive axle, showing the details of the worm and gear mounting on annular and thrust ball bearings

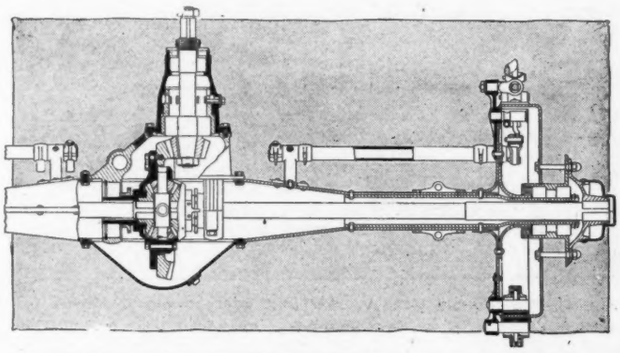


Fig. 4—The Metal Products Company's style 18 bevel-gear rear axle. The housing is made in two halves, riveted together along truss flanges

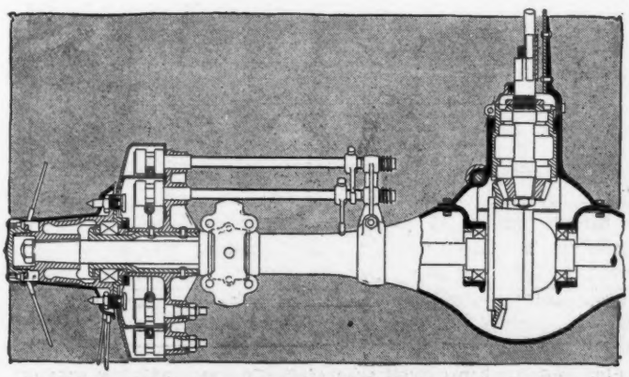


Fig. 5—The McCue Company's model 7XW rear axle of the floating type. This design is shown fitted for wire wheels of the McCue make

Metal Products—The Metal Products Company manufactures two sizes of rear axles of the floating type. These have pressed steel housings, and one of them, style 18, is shown in Fig. 4. The designs of the two are similar, the difference being principally in the load carrying capacity. The lighter type is designed for cars weighing from 2,800 to 3,100 pounds, while the heavier carries vehicles weighing from 3,500 to 3,800 pounds. The housing which integrally inclosed the driving axles as well as the differential and driving gear mechanism is constructed longitudinally in two halves which are riveted together along their edges, forming webs which act as strengthening elements. The usual mounting of driving gears and differential in a hanger removable from the front is present, while an opening at the rear is also provided. The Hudson, Chalmers & Woods electric concerns receive practically the entire output of this plant.

Merchant and Evans—The Evans transmission jackshaft for commercials is manufactured in two sizes, the medium design for vehicles equipped with engines up to 40 horsepower, four-cylinder, 4 3-4 inch bore, and the large type for cars carrying power plants up to 60 horsepower, four-cylinder, 5 1-2 inch bore. The design of the two sizes is practically the same. The differential and driving gear mechanism are made accessible from the top, a cover plate bolting in place and forming a portion of the upper half of the housing. Wheel bearings are double row annulars, while suitable annular ball and thrust ball bearings carry the various shafts throughout. There are three forward speeds provided with this assembly. Second and third speeds are direct.

Muncie—The Muncie Gear Works standard types of jackshafts for commercial cars range in size from the small model for light delivery wagons to carry from 500 to 1,500 pounds to the type for trucks to carry 2,000 to 2,500 pounds with a 30 to 35 horsepower motor. These jackshafts also vary in that some of them are designed to carry gear boxes bolted to them while others do not provide for the unit attachment of the gearset. Fig. 6 shows a model 503 outfit with unit transmission on gearset, giving an idea of the method of bolting the latter to the axle housing through flanges. This design is intended for trucks carrying from 1,000 to 1,500 pounds and equipped with power plants ranging in horsepower from 15 to 20. Annular ball bearings and thrust bearings are used for the differential and driving mechanism, while the sprocket ends of the driving shafts are mounted on Hyatt roller bearings, which are a spiral type, as shown. The jackshaft is geared 3.2 to 1. Gears have a pitch of 5, while the differential gears have 8 to 10 pitch. The frame hangers are adjustable as to distance from center to center within the range of 30 to 36 inches. The transmission provided two forward speeds and reverse, the high speed being direct. This jackshaft is typical of Muncie design.

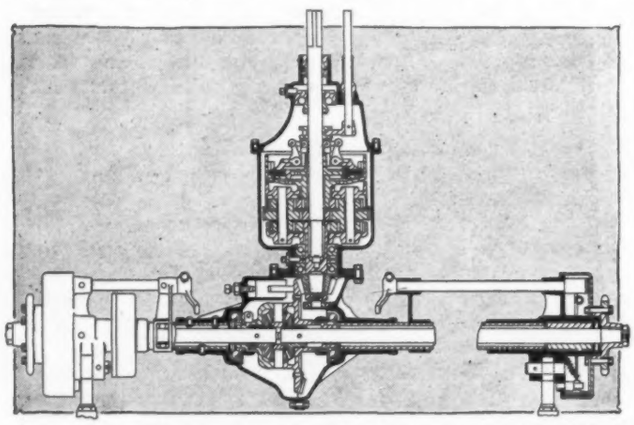


Fig. 6—The Muncie Gear Works' unit gearset and jackshaft for trucks of from 1,000 to 1,500 pounds. The axle shafts are carried on roller bearings

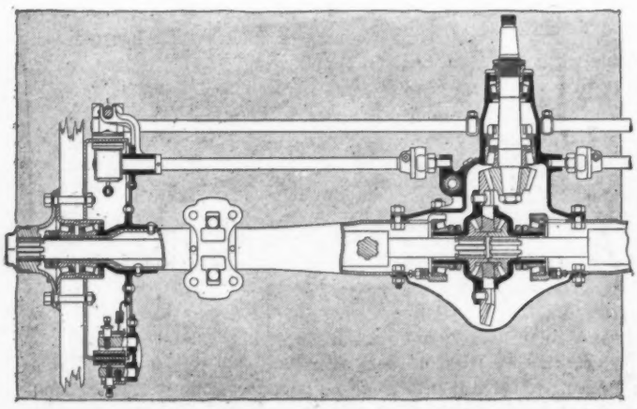


Fig. 7—A Timken-Detroit type of floating rear axle for cars of approximately 2,700 pounds total weight. Note the double roller bearings carrying wheels

Sheldon—In addition to its truck axle equipments, consisting of jackshafts with and without the gear boxes in unit and dead rear axles, the Sheldon Axle Company makes pleasure front and rear axles. With the latter we are specially interested here. A typical Sheldon rear pleasure car construction is the type 201-D, which is a three-quarter floating variety, with torque tube inclosing the propeller shaft and fastening to the differential housing at its front end. This model is for cars weighing not over 2,700 pounds empty. The axle shafts are constructed of nickel steel and have the driving flanges fixed to their ends, which flanges bolt to the wheels. The propeller shaft is also of nickel steel and is mounted on annular ball bearings at its forward end and at the pinion end. The differential is carried on Hyatt roller bearings in combination with straight ball thrust bearings on either side. The differential is so mounted as to be adjustable. The driving pinion, ring gear and pinions are all made of heat-treated nickel steel. The differential unit complete may be removed by taking off four nuts holding the differential bearing caps and taking out the axle shafts. The axle tubes are not internally constructed with the differential housing but are separate pieces which rivet to the housing. This may also be said of the propeller shaft tube. Brake drums are of pressed steel 14 inches in diameter. Brake levers may be optionally located at the drums or inside the frame.

A notable feature of Sheldon construction this year is that the hubs of all axles are made so as to take any make of standard annular bearings interchangeably, or any standard roller bearings in annular series.

The Sheldon company has also brought out a new worm driven axle employing an imported worm of the overhead type. The details of this new axle are not forthcoming at this time.

A. O. Smith—Besides producing pressed steel frames, clutches, steel stampings and various forgings for motor cars and trucks, the A. O. Smith company also makes axles front and rear, for pleasure cars and trucks. The pleasure car types are made in three sizes, model 4 for cars weighing up to 3,000 pounds, model 5 for those up to 4,000 pounds, and model 6 for heavy types having a maximum weight of 5,000 pounds. The rear designs are built on the unit principle, embodying simplicity and ease of adjustment. The housing used is of pressed steel of the integral truss type, the truss webs extending along the top and bottom. The ends are re-enforced by long swaged tubes, the outer ends of which form the bearing sleeves. These in turn are bridged across by the brake supports. These axles are equipped throughout with Whitney roller bearings, which are now manufactured by the Smith concern. There is the usual opening at the rear for inspection and adjustment of the gearing. The spring centers are variable within limits. External and internal brakes are supplied, and for model 4, the drum diameter is 14 inches. The other two models have 16 inch drums.

Salisbury—The Salisbury Wheel and Manufacturing Company manufactures floating rear axles which have pressed steel housings, the axle tubes being integrally formed with the housing for the gears and driving mechanism. The usual construction

having the differential driving pinion, together with the necessary bearings in one unit, obtain in this construction, the entire unit bolting to the front of the housing through an integral flange, the extension of which forms the bearings for the differential and its parts. The driving shafts drive the wheels through clutches. Annular ball bearings are used throughout the construction, one single-row annular being mounted directly under the vertical center line of the spokes of each wheel, while suitable annulars carry the differential on either side. Ball thrust bearings take care of the end thrust. The brakes are in two sets, service and emergency, both internal expanding, and they are concentric. In connection with this axle a triangular torque rod is used, the mounting for the rear end of this being integral with the outer flange of the differential carrier.

Stutz—The Stutz Auto Parts Company is the maker of a transmission and rear system which consists of a rear axle, gearset, propeller shaft and torque tube in unit. The transmission gearset housing is of cast aluminum, while the greater part of the driving and differential housing is made in a single unit. New Departure ball bearings are used throughout the construction of the gearset and the driving gear unit, while the propeller shaft is mounted on Hyatt roller bearings. These unit systems are constructed in two sizes, the smaller for cars under 25 horsepower, and the larger for those ranging from 25 to 40 horsepower. The gears are of the bevel type.

Timken—The Timken-Detroit Axle Company's line is most complete for all types of vehicles, both pleasure and commercial. It includes both front and rear types. A typical pleasure car design is that shown in Fig. 7. This is a floating type for cars weighing completely equipped, less passengers, approximately 2,700 pounds. Special features embody a continuous pressed steel housing, with its ends swaged and ground for the bearings. The oil retainer tubes are welded into position and extend in close to the differential. The carrier embodies the complete power plant with all gears, bearings and differential integral. The drive shafts are of nickel chrome steel, both ends being six-splined to received the end flanges which bolt to the wheels. Timken adjustable roller bearings, which are combination thrust and annular types, are used throughout the construction. Each wheel is carried on two bearings, while one is placed on either side of the differential mechanism, one just back of the driving pinion and another at the end of the pinion shaft, where it connects to the propeller shaft proper. The rear cover plate is of pressed steel and provided with filling and oil level plugs. The brake drums are of pressed steel, 14 inches in diameter on the No. 5220 shown in Fig. 7. All operating parts of the brakes are provided with anti-rattling devices, while both brake levers are brought in to the center with standard construction. Option of levers at drums may be had. All gears are drop-forged, hardened and ground with the idea of making them as silent as possible. Gear ratios are from 2 13-21 to 1 to 3 13-14 to 1.

Torbensen—The Torbensen Gear and Axle Company manufactures internal gear drive truck axles, the design of which is radically different from that of conventional American rear axle practice. No changes in the product have been made within the past year, the line consisting of three models, viz., model R for vehicles of about 3-4 ton capacity, model R-1 for those of 1 ton capacity and model S for cars of from 1 1-2 to 2 tons capacity. These capacities refer to the loads. In the Torbensen design there are really two axles, one a solid continuous member of the dead type for carrying the load, and the other, placed just behind it, a driving member of the live type, which turns the wheels through pinions and internal spur gears Fig. 8 gives an idea of the design of the type S. The wheels are mounted on the ends of the dead member, which also carries the wheel gears. The spurs connecting with these gears are mounted on the supplementary axle, in which is also incorporated the differential mechanism. The main speed reduction takes place directly at the hubs of the wheels, hence the rotative speed of the engine is reduced but little until it reaches these wheels. The Torbensen concern is now prepared to furnish its axles with any bearings, domestic or imported, which may be specified. The dead member is now furnished in any desired alloy steel.

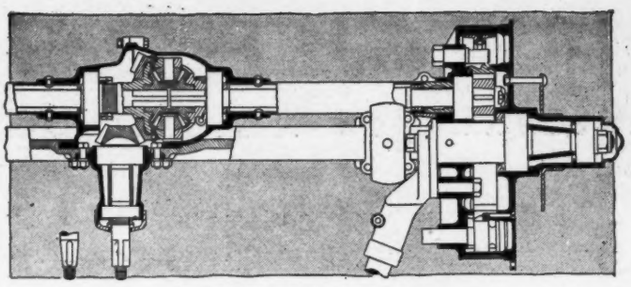


Fig. 8—The Torbensen type S rear axle for trucks which is of the internal gear type. The driving member is back of the dead-load member

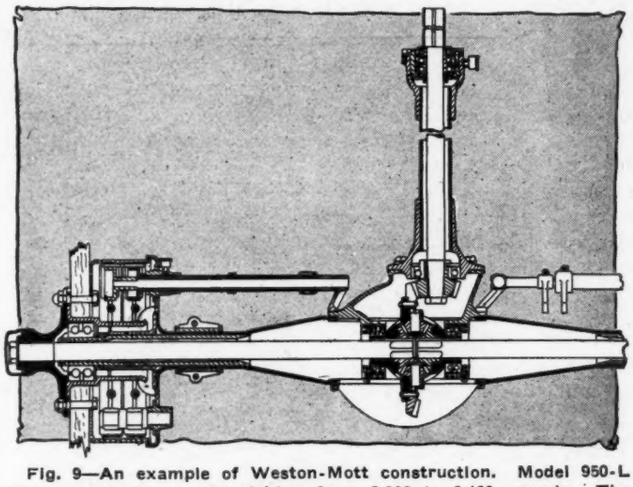


Fig. 9—An example of Weston-Mott construction. Model 950-L floating axle for cars weighing from 2,800 to 3,100 pounds. The housing is externally webbed

Warner-Toledo—The Warner Manufacturing Company includes in its product of various automobile parts, heavy duty truck and light delivery car jackshafts, which incorporate with the differential and axle driving members, the Warner gearsets, which are selective, sliding-gear types. The gears are accessible through cover plates, which inclose the upper part of the driving mechanism and differential gearing. For delivery wagons with capacities up to 1,500 pounds, the jackshaft is furnished with either a three-speed selective gearset or a planetary type. The brakes with this construction are 10 inch expanding.

Weston-Mott—The Weston-Mott Company is in the field with a complete line of bevel-gear rear axles, the models being fifteen in number and covering all maximum car weights from 1,500 pounds to 5,000 pounds. These are of three general types, namely, fixed hub, semi-floating; single-bearing floating, and double-bearing floating designs. The first of these is the simpler and in it the hubs are usually keyed or fixed to the outer ends of the shafts, the inner ends of which float in the differential. The single bearing floating types are constructed either with a roller bearing or a ball bearing placed durectly under the spokes of the wheels. The double bearing type carries two ball bearings in each hub, a large one to carry load and end thrust and a small one for load only. The shafts are made with integral driving clutches. A typical example of the latter class is the model 950-L, which is adapted to cars weighing from 2,800 to 3,100 pounds. It is shown in Fig. 9. It has a pressed steel housing of the externally flanged or webbed type.

In general all Weston-Mott axles have bevel rings and pinions cut with corrected teeth, which adds to the silence. High carbon or nickel steel is used in the driving shafts, while the bearings are either Hyatt rollers or New Departure ball bearings. Ball thrust bearings are of special Weston-Mott design.

Retainers Improved in Special Bearings

Although Conservative to the Highest Degree, the Makers of Bearings Have Made Minor Improvements—Some Other Interesting Accessories

CONSERVATISM is about the most marked quality in the bearing field for this year. Where the ball and roller bearing representatives were approached at the show it seemed to be the case that where a thing had only been on the market for 2 or 3 years it was regarded as new. The introduction of the automobile has presented but few added problems to the bearing manufacturer. Where changes have been made they have come but slowly and only after long periods of experiment. The big point in ball and roller practice seems to be to get a good retainer. With these few facts in mind, a brief survey of the field as represented at the New York show may be given.

Hess-Bright

No departures from standard design have been made by the Hess-Bright Manufacturing Company in the line of bearings brought forward for the consideration of the car manufacturer. The experimental laboratories of Wittenau, Germany, and the smaller one of Philadelphia, are constantly engaged in making detailed improvements and one of the most recent developments brought out by this concern is a retainer which is especially suitable for automobile installations. In order to keep manufacturers in touch with the latest improvements, the Hess-Bright company supplies data sheets in loose-leaf form. These are added to from time to time and are kept up to date.

J. S. Bretz

These imported bearings, made by Fichtel & Sachs, Schweinfurt a-M., Germany, and imported by J. S. Bretz, New York City, are made in every type of installation for automobiles. They are used by more than fifty American automobile manufacturers. The distinguishing feature of the F. & S. ball bearings is that by the use of a patent cage, 95 per cent. of the ball race is filled with balls and at the same time there is no inter-ball contact, each ball being guided separately and independently. The radial bearings are made principally in three series, A, B and C, the lightest being A and the heaviest C. A special magneto series under the name of type F is also made.

R. I. V.

The R. I. V. is an imported ball bearing made in all sizes and adopted on many of the standard American makes of automobiles. The series includes light, medium and heavy-weight models of radial and thrust types. A special line is made for ball bearing-equipped axles, for commercial or other heavy service. The latter is especially interesting in that a bronze auxiliary bearing is so fitted that it will not be in play under ordinary circumstances or service, but will come into effective use in case of extreme overload or other emergency. This extra bearing takes the form of a bronze bushing supported by two collars which withstand the lateral pressures used by making a steep turn out of a rut or around a corner at high speed. Special steering gear with combination rear axle and gearset installation are also specialized.

New Departure

The New Departure Manufacturing Company specializes on three distinct types of bearing, the double row, single row and Radax. The latter bearing is named from the fact that it is designed to withstand a combination of radial and axial load in one direction. The Radax bearing is made in the international standard metric sizes the same as the single-row bearing. In many respects this bearing is equivalent and the same as one-half of the double-row bearing. This is true especially of the radial load. In the axial or thrust load, however, it is the equivalent of the double row. A steel separator is used with this bearing.

American

Front and rear axles and the ball bearings used in their installation are made by the American Ball Bearing Company. This concern, which has had a steady growth since its organization in 1885, has started the manufacture of axles in 1900. Since then axles have been specialized. All the parts for the axles are assembled in the American Ball Bearing Company's assembly rooms and are shipped complete. The finishing of the ball-bearing cups and cones was done in the American plant by small abrading wheels and no water cooling is used. This is known as the dry grinding process. The wet grinding work is used on the larger material, such as axle parts, etc.

Rhineland

Rhineland is an imported ball bearing brought to this side by the Rhineland Machine Works and made at the home factory in Düsseldorf. Both tradial and thrust bearings are made and all the latter except those for light loads have a ball-shaped, stationary ring, which is designed to afford an equal distribution of load on all balls. The balls on all the thrust bearings are held in place by brass cages. The radial type will take 25 per cent. end load, but not more than 10 per cent. in the heavy series. Double-row bearings and others especially adapted to serve radial or combined radial and thrust loads are also manufactured by this company.

Atlas

The Atlas Company is an American concern making alloy steel balls guaranteed to be round and true within .0001 inch. The steel used in these balls is a chrome alloy manufactured abroad in the Girod electric furnace process. They are hot forged in specially constructed furnaces so designed that no direct flame can ever strike the field while they are being heated. The balls are forged in strings and then cut apart. After this they are annealed and allowed to rest before being rough ground. After thorough grinding they are sent through a smooth grinding process, which brings them within a few thousandths of 1 inch above the proper size. The heat treatment is then given the balls and they are hardened clear through. This is an advantage as compared with case hardening.

S K F

S K F radial bearings are made in a type which is especially designed to take care of misalignment of the shafting. The bearing is so designed that the balls can run out of line in any direction. They are held in place by a single-piece retainer without rivets of screws, with floats between the ball races and is practically frictionless. The bearing may rotate so much out of line that it produces the same effect as a ball and socket joint capable of adjusting itself automatically to any deflection in the shaft upon which it is mounted. No binding strains are introduced on the balls when the shaft is traveling out of line. In the case of the double row, the load is automatically dis-

tributed on both rows of balls. The steel used is what is known as a Swedish crucible alloy steel, the iron being taken from the Swedish mines. The S K F thrust bearings are made in single and double type and possess the same self-aligning features as the radial type.

Bantam

The Bantam Anti-Friction Company is one of the few that make both ball and roller bearings. These are made for all installations either of the thrust or radial type. The collars in the thrust ball bearings are made of tool steel and the cages of bronze. Thrust bearings with grooved collars are made with inside brass thimbles. Radial bearings of the all-ball type are also manufactured. Cup and cone bearings in all sizes can be furnished by this concern, while in the roller department an equally wide range of choice is offered.

S. R. O.

The S. R. O. is a bearing which is made in Switzerland by one of the largest European factories. The balls are cut from solid steel as compared to the tubular stock. Many of the foreign manufacturers are users of this bearing. The ball races in the S. R. O. bearing are specially featured. The notches for the balls are shallow and do not reach the bottom of the race This eliminates a common cause of trouble and makes for a minimum of wear. Al sizes of annular and thrust types are manufactured by this concern. All are fitted with a cage made from pressed-steel stamping riveted together.

Imperial

A full line of annular and thrust bearings is manufactured by this concern. The feature which is most prominent in Imperial design is the cage or ball retainer. This retainer has been designed to allow of as many balls as possible in the space provided, without permitting the inter-ball contact, which is highly detrimental. The Imperial retainer consists of a one-piece body with a closing ring. The Imperial balls are made in England and are guaranteed to .0001 inch. The bearings are made in light, intermediate and heavy series.

Schafer

Schafer ball bearings are imported by Barthel & Daley, of New York City. They are used on sixteen different makes of American cars. This line is the same as for the past year except that a new retainer has been brought out which tends to make the bearing more silent. The balls with this retainer are only in contact with the separator when the bearing is under heavy load. Both the radial and axial bearings are made by this concern as well as combination of annular and thrust. The latter bearing has a two-point contact as against the four-point contact of the cup and cone bearing.

Norma

The ball bearings of the Norma Company of America, New York City, have attained a very high reputation both in America and abroad. Two exclusive features distinguish the Norma ball bearing: the ball cage and the ball races. The former affords an elastic polar guiding of the balls, with minimum speed at point of contact, and the minimum of noise and internal friction. The inner race is ground to a circular ball seat with a radius slightly larger than that of the ball. The outer raec has a ball seat of similar radius, but at the normal contact line between balls and race, the curved race surface meets a tangent cylindrical surface. This makes the Norma an open-type bearing of unequaled accessibility. And the design of Norma cage and races permits the use of more balls, and larger balls, than any other construction having substantial uninterrupted race shoulders.

Outside of the line of ball bearings described for the Norma concern a full line of roller bearings is carried. These are distinguished by a crown outer race. The rollers themselves are cylindrical and run in free guide. The roller has a full bearing on the surface of the inner race, because this is also cylindrical. On a light load the bearing of the roller on the outer race is only at the point of crown on the outer race. Under heavy load the outer race flattens to the form of a true cylinder and gives a full bearing on this race also.

Timken

The Timken line of roller bearings is complete. Timken uses the tapered roller in long and short series. The short series is suitable for an annular replacement, should such be desired. It is made in the same sizes as ball bearings and is interchangeable with any of the standard makes. The Timken cages are of flat steel. Owing to the tapered form of the bearing it is not necessary to use a ball thrust with the roller bearing. The slope of the rollers is sufficient to render the bearing capable of withstanding a heavy thrust or axial load. The Timken axle line, fitted with bearings of the same make, is continued in all sizes for trucks and pleasure cars.

Standard

A new series of interchangeable bearings designed to be of the same size as the standard makes of ball bearings have been brought out by the Standard Roller Bearing Co. This type of roller bearing has cylindrical rollers with grooved centers. These bearings run on ribbed races, the rib running through the groove in the roller. Cup and cone roller bearings and straight roller types are made by this concern, while in the ball bearing field they manufacture a series of closed type in all sizes.

American

The American Roller Bearing is of the annular non-adjustable type. The rollers are cylindrical in shape and run between cylindrical races. Alternate rollers are smaller in size and all rollers bear upon each other. The smaller rollers act in the nature of a separator, while the large rollers carry the load. As the friction between the separating rollers and the load carrying rollers is independent of the load, it is very small. Ball and thrust and dust washers are fitted to these bearings, which are made in all sizes.

Bower

The Bower roller bearings are of two types, one in which a wedge shape enlargement takes the end thrust, and the other, which carries the end thrust on a groove cut in the roller. The rollers are cylindrical but carry, as explained above, both radial and thrust loads. When the thrust is carried on the wedge shaped enlargement, the roller runs in guide rings at each end with small diameter spindles. The other type of roller is carried by a thrust shoulder on the outer race. The guide ring in this case is in the form of a single slotted ring.

Gillette

The Gillette roller bearing is of the tapered cup-and-cone type. No cages are used, but a retaining ring is fitted to hold the rollers on the cone when the cup is removed. A thrust flange is fitted on the back of the cone to take up end play. A snap retaining ring on the small end of the bearing holds the cup in place. When the ring is removed the cup and rollers can be taken out.

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Spark Plugs Not Yet Discussed

Below are given the descriptions of several prominent makes of spark-plugs which did not find space in the issue of January 30. They include the products of important companies in which the automobile public needs must be interested.

Oakes & Dow Company—The two types of spark-plug made by this Boston concern are well known as sootless mica plugs. None but pure Indian mica is used in these plugs. The

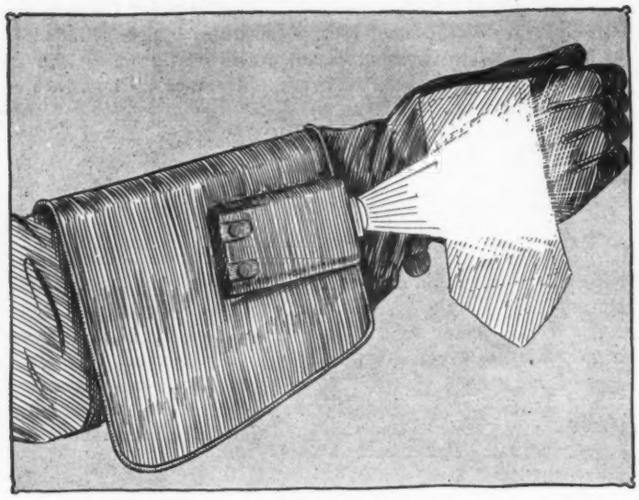

Fig. 1—Flashlight glove designed by Baroness Van Haeften-Hatch

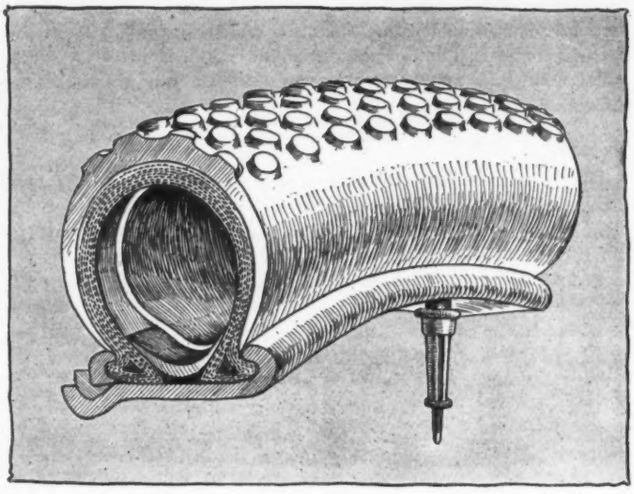

Fig. 2—Walpole tire with Bailey tread

positive electrode, in the manufacture of this accessory, is wrapped with sheet mica and driven into the plug shell with a blow of the hammer. Mica rings are threaded over the wrapping and fixed by a locking ring. The mica is then turned in a lathe and polished.

Rex Ignition Company—The Rex Spark plug made in New York City consists principally of three pieces, namely, the porcelain, the shell and the bushing against which the porcelain is packed by two rings. The electrode is of imported wire and claimed to be proof against burning out and the whole plug to be sootproof.

Ideal Switch Company, Incorporated—Five types of spark plugs are manufactured by this company at Plainville, Conn. The high tension and adjustable gap designs are said to be rust, soot and heatproof. The first type is or ordinary appearance with a straight positive electrode and a bent wire as negative point. The adjustable gap type is distinguished by the use of a special gland or bushing fitting between the shell and the porcelain and working in a thread of the latter, so that the porcelain may be raised or lowered. The central electrode in this case is bent toward the periphery of the shell. The porcelain and the shell are marked with one vertical arrow each and if these arrows are in alignment the shortest spark gap is obtained. The Ideal company also makes a conical type plug which has its name from the shape of the porcelain, a closed end case design with a contracted shell opening and a mica core plug.

Charles D. Shain—The Shain spark plug is distinguished by the shape of the positive electrode which is formed as a ball fitted with a peculiarly shaped head. The latter as the form of a downwardly diverging cone made of a special metal sheet into which deep corrugations have been cut to give the effect of an inverted crown. The points of the crown act as sparking points.

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Accessories of Unusual Interest

Rose Manufacturing Company—This company, of Philadelphia, Pa., continues its line of lamp brackets and radiator heaters from last year. The first series of products comprises brackets which support both the tail light and the rear license number; besides, the well-known radiator license bracket is being made by this company. The radiator heater is made in two styles, both of which have the effect of keeping the cooling water at a temperature preventing its freezing. One style of the heater is adapted for illuminating gas and the other for oil; but the gas type may be also used with acetylene.

Walpole Tire & Rubber Company—The Boston company of this name manufactures both inner tubes and casings. The inner tubes are of red rubber, constructed heavily and claimed to contain the highest grade of up-river Para rubber. The casings of this company include clincher as well as Q. D. designs, and plain treads may be obtained as well as non-skid types. The non-skid treads are of the Bailey class and consist of rubber vulcanized to the ordinary degree on which truncated-cone projections are formed, there being alternate rows of three and four projections each. This construction provides a variable-width contact between the tire and the ground, making sidewise sliding very difficult.

Flashlight Signal Glove—The latest idea in accessories is the signal glove designed by Baroness Van Haeften-Hatch, of Newport, R. I. The purpose of this device, which is illustrated in Fig. 1, is to provide a clear signal to the driver of the following car whenever it is desired to stop or to turn a corner. The thick traffic of the city streets is not limited to daylight and many of the accidents which have evidenced themselves very clearly in the marked rise in automobile insurance rates have occurred after nightfall has rendered it impossible for the drivers to observe the signals made from surrounding cars. The glove is of best grade leather with stiff cuff. It is built along the regular gauntlet lines with a strap to fasten it securely to the hand. A lamp is mounted on the back of the wrist portion of the glove and a piece of heavy white kid on the back of the hand. The light is controlled by two brass contact points mounted one on the thumb and the other on the index finger of the glove. When these two points are pressed together a light is immediately flashed on the white cloth.

Peck Wheel Company—The Peck wheel is manufactured for both pleasure and light commercial cars. It consists of a solid outer rim which carries the solid rubber tire and to which are fastened twelve plungers or pistons equally spaced around the rim's inner circumference. Each plunger fits within one of the twelve cylinders which are attached at their lower ends to the wheel hub so as to have radial play. Thus the pistons and their mating cylinders form the spokes of the wheel when the parts are assembled. Interposed between each piston head and its cylinder head is a coiled spring which acts to force the piston out to its normal position when sufficient load force is not exerted to overcome the spring resistance. Thus the weight which the wheel must carry is carried by the upper arc of the wheel. In addition to the coil springs, there is an air cushion under each piston which adds to the resiliency when pistons are forced in. The free radial movement of the pistons and cylinders makes for flexibility of drive.

Sewell Cushion Wheel Company—Sewell cushion wheels are designed for gasoline and electric trucks, motor 'buses and motor-driven fire apparatus. The Sewell construction embodies a complete wooden inner wheel and an extra wooden felloe out-

side of this. The felloe carries any standard solid tire. Between the wooden wheel and the outer felloe is interposed a rubber cushion which appears in three forms, namely, a flat cushion for heavy trucks, rubber rolls for light commercials and zig-zag cushions for medium trucks. The two wheel parts are held together by side rubber flanges which thus preserve the resilient feature.

Ideal Steel Wheel Company—The Ideal wheel replaces the spokes of the ordinary wheel by ten elliptical steel springs, each of which is made of two strips of thin spring steel sprung between hub and rim to the proper tension. These strips fasten to both the rim and hub. When assembled the spring strips bear radially against one another, thus bracing and counterbracing. When assembled the springs are designed to give both lateral and radial support. In action, each spring carries a portion of the load.

Seaton Wheel Company—In the Seaton wheel there is an inner and an outer portion. Interconnecting these two is a series of tension coil springs, the supports for which are alternately connected to the inner and outer wheels. The springs are mounted horizontally between the segments. When a load is placed on the axle, the inner wheel sinks with relation to the outer, the center lines of the coil springs then being out of their horizontal position. This movement is provided for by the swivel mountings of the springs in the alternate segments, one of which is attached to the inner portion of the wheel and the other or mating segment to the outer on the opposite side.

Favary Wheel Company—The Favary construction is really a mechanical tire in which resilience is obtained by the flex action of a combintion embodying pliable bands under tension. There are three bands to each tire, and between each a series of aluminum blocks is interposed, these blocks being riveted to the fabric the layers of blocks being in staggard relation so that when one set of blocks is pressed inward it sinks between the blocks on the next lower layer, giving the resilient effect.

Schermack Wheel Company—The Schermack spring wheel is an all-steel type and consists of a hub section or inner wheel and an outer wheel carrying a standard solid tire. The two sections are provided circumferentially with aligned projecting flat steel springs or brackets fastened together in pairs by cross bolts. When assembled, the flat springs, one of each pair being fastened to the inner portion and the other to the outer part on the opposite side, are under tension, the resilient action being permitted by the ball and socket connections of the flat springs and the cross steel bars which are normally horizontal, but deflected under load.

Rajah Auto-Supply Company will continue the manufacture of their familiar line of Rajah spark plugs and terminals for the coming season, with the addition of the new Rajah starter and Rajah giant plugs that have recently been introduced to the trade. The Rajah starter plug is simple, easily adjusted, efficient and well designed for the purpose for which it is intended. The Rajah giant plug is a big, strong plug of extreme simplicity and durability.

(*Continued from page 425*)

power of the dynamo. This form of construction does away with the necessity of including any electrical controlling device other than the usual voltage and reverse current cut-out, as shown in the wiring diagram, Fig. 8. This device, in this particular case, is arranged alongside the magnet inside the cover. The armature is of the ordinary slotted drum type run on ball bearings. Carbon brushes are used and these are easily accessible by simply unscrewing a pair of caps on the side of the bearing end cover. The output curve, Fig. 9, shows clearly how the current increases with the speed until 12 amperes is reached, when it is cut down by the action of the magnetic shunt to an almost constant level of 10 amperes, irrespective of increase of speed.

Holtzer-Cabot—Uses Centrifugal Cut-in

The most notable feature of the Holtzer-Cabot lighting system is that regulation of the current at high speeds is obtained inherently by the special construction of the generator. A single centrifugal switch which cuts in the generator at the correct speed is the only controlling device with moving parts.

The generator is a two-pole machine with a cylindrical magnet casing of laminated iron. The pole pieces are of special design, having long extended tips, which so controls the action of current generation as to choke down the higher speed currents, owing to the self-induction set up in the armature.

An ingenious form of cut-out is employed, acting on the centrifugal principle. Its construction is shown diagrammatically in the plan of wiring, Fig. 17. The outer ring R is made up of three parts electrically insulated from each other, as in commutator construction. The large inner segments is in electrical connection with one of these parts. Two contact weights or segments W attached to springs extending from the large segment, are so arranged that when the device is rotating at a certain predetermined speed, they fly out due to centrifugal force and make contact with the adjacent parts of the outer ring. All three sections of the ring are then electrically connected. Two carbon brushes bearing on the outer surface of the ring at diametrically opposite points are wired to the generator and battery line respectively. It will be seen how this arrangement makes it impossible for current to flow until the segments W are in contact with the outer ring.

The generator is shunt wound and is connected up with the battery floating on the line as in most systems.

Vesta—Controls by Resistance

In the Vesta lighting system reliance is placed on the simple permanent-magnet generator, without any field adjustment of any kind. The output regulation is effected by the insertion at high speeds of a single step resistance in the main circuit. This method is a development, or rather a simplification of the Vesta generator of last year in which a small rheostatic resistance was used for the same purpose. It has been found that a single step affords ample control and at the same time avoids complication.

An external view of the generator is given in Fig. 12. The magnets are of the usual type, mounted in pairs as in magneto practice, and made to slip over the pole pieces. End covers are fitted rendering the machine dust-proof. One of these has a small rectangular extension which surrounds the commutator and supports the two brush-holders; the other forms a housing for a centrifugal governor shown in detail in Fig. 11. This device alone controls the output. A wheel W is mounted on an extension of the armature shaft in such a manner that while stationary it occupies a skew position owing to the action of a spring S, which exerts a pull on one side through a short connecting link attached to a collar on the shaft. The balance wheel and spring are so proportioned that when an armature speed of 200 revolutions per minute is reached the centrifugal action of the wheel withdraws the collar and permits the two contact points C1 to come together.

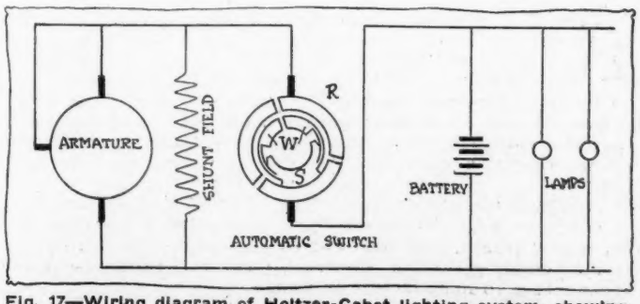
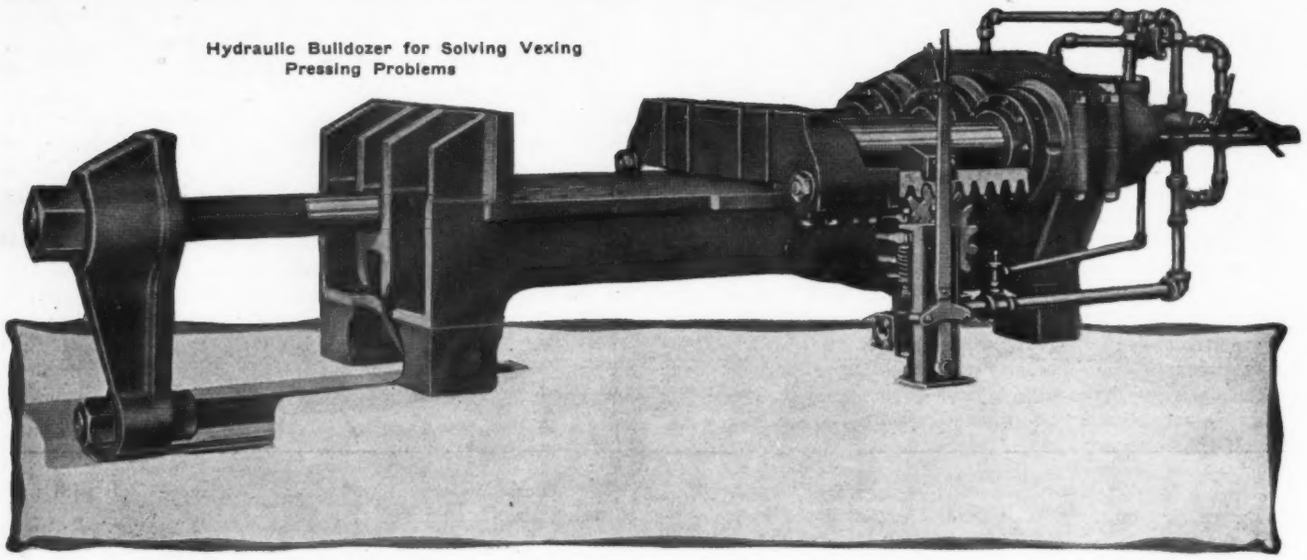


Fig. 17—Wiring diagram of Holtzer-Cabot lighting system, showing automatic switch

Factory Miscellany

Hydraulic Bulldozer for Solving Vexing Pressing Problems



The above illustration depicts an instrument known as a bulldozer. This is a heavy slow moving die which shapes large parts such as axles. The machine depicted was designed by the Watson Stillman Company of New York for manufacturers of heavy axles for automobile trucks. The bar which is to be upset, split or shaped is placed on the flat table or bed plate with the opposite end to that which has to be worked upon placed against the heavy upright beam shown at the extreme left. The bulldozer shown here is operated by hydraulic pressure.

The width of the bed plate is 44 inches; maximum opening between moving cross beam and rigid cross beam 48 inches; maximum opening between moving cross beam and adjustable stop, 90 inches; length of moving cross beam, 48 inches; diameter of rams, 11 inches; stroke, 15 inches; maximum liquid pressure per square inch, 1500 pounds; diameter of horizontal extension bolt, 6 inches. The weight of the complete machine is 20,000 pounds.

A notable feature of this machine is the arrangement of its three rams, all connected to the one head to permit the use of only one, of two, or of all three rams, depending on the pressure necessary. With one ram—the middle one—the capacity of the bull-dozer is 56 tons; with the two outside rams, 127 tons, and with the three cylinders in use simultaneously the capacity becomes 200 tons.

EASTERN Rubber's Factory—The Eastern Rubber Company, recently organized in Toronto, Ont., to manufacture automobile tires, etc., has secured a site of four acres. Two manufacturing buildings will be built—one three stories high, about 250 feet by 72 feet, and another 200 feet by 72 feet, one story. In addition there will be suitable warehouses and a power plant. The capacity of the company's plant, without any increase to the initial machinery equipment, will be approximately $2,225,000 per annum, and it expects that the business during the first year will amount to about $1,000,000.

Mayer Carbureter Builds—The Mayer Carbureter Company, Buffalo, N. Y., is planning the erection of a factory at Detroit, Mich.

Perkins, of Washington, Builds—W. A. Perkins, Seattle, Wash., will construct a $250,000 plant in Centralia, Wash., for the manufacture of automobiles and parts.

Canadian Firm Planning Factory—The Canada Standard Automobile & Tractor Engine Company, Moose Jaw, Sask., is having plans prepared for the construction of a new factory.

Pioneer Tire Equips Plant—The Pioneer Steel Block Tire Company, St. Louis, Mo., recently capitalized with a capital of $25,000, will in the near future equip a plant for the manufacture of a patented tire for use on automobile trucks.

Working Day and Night—The Speedwell Motor Car Company, Dayton, O., is now working both night and day shifts and the prospects for future business make it extremely likely that this condition will exist for several months to come.

Albion Establishes Factory Garage—The Albion Motor Car Company, Ltd., of Glasgow, Scotland, a large manufacturer of motor trucks, has arranged to establish a factory garage for assembling cars in Montreal, Que., and proposes in the near future to manufacture in Canada.

Doubles Space—The Oakes Fan Company, Indianapolis, Ind., recently doubled the floor space of its factory, increasing its force of men as well as its equipment of machinery. It has bought all the machinery and tools owned by the Enders Tool & Machine Company.

Fire in Buick Plant—The brass and aluminum foundry of the Buick Motor Car Company, Flint, Mich., was destroyed recently by fire with a loss of $40,000. The burned structure was only the frame building in the plant, and so it will be rebuilt. The drop forge department was saved.

Swinehart to Enlarge Factory—With the advent of commercial cars the solid tire business of the Swinehart Rubber Company, Akron, O., has increased until the capacity of its plant is taxed to its utmost and the company is now increasing its plant to add several million tires a year to its output.

Maroney Goodyear Manager—J. A. Maroney succeeds E. H. Parsons as manager of the St. Louis, Mo., branch house of the Goodyear Tire & Rubber Company. Mr. Parsons has been promoted to manager of the St. Louis district, which takes in cities in Missouri, Oklahoma and Texas. This transfer takes place at once.

Royal Factory in England—The Royal Motor Car Company, London, Eng., which was recently organized with a capitalization of $500,000, has concluded to erect its factory in Strathroy, this decision having been arrived at following negotiations with the Strathroy Council. The town makes a loan of $50,000, gives a free site and other inducements. It is the intention of the firm to start work as soon as possible on a factory 400 feet by 200 feet and two stories high.

Kenen Building Light Trucks—The Kenen Motor Company, Los Angeles, Cal., will in the near future produce light trucks. To fulfill this the company is at present enlarging its plant, which, when completed, will give a structure measuring 200 feet by 325 feet. A factory output of 30 trucks a month is expected when the addition is completed. Fixtures, jigs and machinery for the new factory are in process of construction in Detroit, Mich., and will arrive in Los Angeles by the time the addition is ready to receive them.

Shows, Conventions, Etc.

Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
Feb. 1-8.....Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.
Feb. 3-8.....Washington, D. C., Annual Show.
Feb. 8-15.....Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
Feb. 8-15.....Minneapolis, Minn., Annual Automobile Show.
Feb. 10-15.....Chicago, Ill., Truck Show.
Feb. 10-15.....Winnipeg, Man., Show, A. C. Emmett.
Feb. 10-15.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
Feb. 11-15.....Binghamton, N. Y., Annual Show, State Armory. Dealers' Association, R. W. Whipple.
Feb. 15-22.....Albany, N. Y., Annual Show, State Armory, Dealers' Association.
Feb. 15-22.....Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
Feb. 16-23.....Richmond, Va., Annual Show.
Feb. 17-22.....Kansas City, Kan., Annual Automobile Show.
Feb. 18-19.....Madison, Wis., Annual Show, City Market Building, Dealers' Association.
Feb. 18-21.....Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
Feb. 18-22.....Baltimore, Md., Annual Show, B. A. D. A.
Feb. 19-22.....Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
Feb. 19-22.....Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
Feb. 19-22.....Kalamazoo, Mich., Annual Show.
Feb. 19-23.....New Orleans, La., Annual Show.
Feb. 19-27.....Topeka, Kan., Annual Show.
Feb. 20-22.....Canandaigua, N. Y.. Automobile Show, Louis Blumenstein.
Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
Feb. 24-27.....Kansas City, Mo., Truck Show.
Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
Feb. 25-28.....Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
March 3-8.....Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
March 3-8.....Denver, Col., Annual Show, Municipal Auditorium.
March 3-8.....Pittsburgh, Pa., Annual Automobile Show.
March 3-8.....Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
March 3-18.....Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
March 5-8.....Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.
March 5-8.....Louisville, Ky., Annual Show, Dealers' Association.
Mar. 5-8.....London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
March 8-15.....Boston, Mass., Annual Automobile Show.
Mar. 8-15.....Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
March 12-15.....Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
March 19-26.....Boston, Mass., Annual Truck Show.
March 20-24.....New Orleans, La., Annual Show, N. O. A. D. A.
March 24-29.....Indianapolis, Ind., Annual Automobile Show.
March.....Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.

Race Meets, Runs, Hill Climbs, Etc.

May 30.....Indianapolis, Ind., 500-Mile Race, Speedway.

Foreign

March.....France, Sealed Bonnet, 3000-Mile Run.
March 31.....Montevidio, Uruguay, International Competition of Agricultural Motor Vehicles.
April.....Barcelona, Spain, International Exhibition.
May.....St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Truck Factory for Nevada—An automobile truck factory will be built on a Nevada, Ia., site by the Nevada Manufacturing Company. Temporary quarters will be built at once on land recently leased.

Toledo Electric Company Builds—The Electric Auto Lite Company, Toledo, O., is building on addition to its plant on Michigan street, providing for 40,000 square feet of floor space. The company manufactures a new combined electric lighting and starting system for automobile equipment.

Diehl Adds New Building—The Diehl Manufacturing Company, Elizabethport, N. J., has taken title to 12 1-2 acres of property fronting on Newark avenue. The greater portion of this property lies in the city of Elizabeth, although there is a 16-foot frontage in the city of Newark. The frontage on Newark avenue measures 832 feet with a depth of 630 feet to the Pennsylvania Railroad.

Lewman's Tire Factory—H. L. Lewman, of the Fall City Construction Company, Louisville, Ky., is at the head of a company, which is being organized to establish a tire factory in that city. The exact location of the plant has not yet been determined, but construction details will be forthcoming shortly.

Floods Oakland Plant—Works Manager Humphries, of the Oakland Motor Car Company, Pontiac, Mich., says the company suffered a damage of $12,000 because of the recent flood which filled the basement of plant number 1 and caused a temporary shutdown of that building. Flood conditions have been overcome and the plant has resumed its manufacturing operations.

Tate Electric to Build—The Tate Electric, Ltd., organized by Montreal and Toronto, Ont., capitalists to build electric pleasure and commercial cars, will erect a plant at Walkerville, Ont. A site has been secured on St. Luke's Road, and a two-story building, covering 42,000 square feet of brick and steel construction, will be erected. Albert Kaltschmire is manager.

Lord Baltimore's Production 1,000—The Lord Baltimore Motor Car Company, Baltimore, Md., manufacturer of the Lord Baltimore commercial car, announces that it will produce this year 1,000 1,000-pound delivery wagons, 100 one-ton trucks, 100 one and a half-ton trucks and 100 two-ton trucks. The firm will erect a large factory so as to market and produce this quota of cars.

Spoerers Build Truck—The Carl Spoerers Sons Company, Baltimore, Md., has entered the commercial field and will market 1,500-pound light delivery wagons by May 1. The company expects to turn out fifty of these trucks this year. They will be of 30 horsepower, four cylinders and will have four speeds forward and reverse. The frame will be of pressed steel and the same materials as in all the Spoerer pleasure cars will be used. The wheelbase of this truck will be 150 inches.

Buicks Assembled in New Orleans—After February 1, all Buicks shipped to Central and South America and the West Indies will be assembled in New Orleans, La., specially crated for export and delivered on board by employees of the company, who will see that the machine is so placed in the cargo as to undergo the minimum chance of being damaged. A considerable saving in freight rates also is made as the cars are knocked down, as they reach there from the factory, and take a much lower rate.

Sanford Expands—The Sanford Motor Truck Company, Syracuse, N. Y., has purchased from the Syracuse Savings Bany a three-story brick building for purposes of expansion of its motor truck manufacture, and a force of fifty men will in consequence be increased to 300 before the end of the year. At least 300 trucks will be made this year, doubling the output. For three years the company has been making trucks at a small leased plant on Park street. The new plant will be equipped to turn out 1,000 trucks annually.

Adds 40,000 Square Feet—The Garford Company, Elyria, O., is adding nearly 40,000 square feet of floor space to its plant at that city, for the manufacture of its products. The new buildings consist of a warehouse, 60 feet by 300 feet, of reinforced concrete; a rear axle assembly shop, one-story high, 56 feet by 280 feet, also of reinforced concrete, and an addition to the main building, 45 feet by 45 feet and four stories high. The latter will be of steel and concrete construction, to conform with the style of the present main building of the plant. The improvements will allow for increased manufacturing facilities in the plant, removing several departments which now find themselves in cramped quarters. The stock and tool rooms, now housed in the main building, will be moved to the new assembly plant, allowing for the installation of a great deal of new machinery the company has had on hand for some time but has been unable to place.

Banquet of the New York Garage Association, recently held, at which the high cost of gasoline was discussed by the speakers

Western Electric Salesmen Meet—The Western Electric Company, New York, recently held a conference of salesmen throughout the country in Chicago, Ill. The week was an extremely busy one, with a wide variety of entertainment, together with numerous talks by members of the manufacturing staff in explanation of the process and inspection methods pursued.

Maxwell Commercial Manager—C. A. Forster has been appointed commercial manager by the Maxwell Motor Company, Inc., Detroit, Mich.

Vancouver's Trucks Number 232—The number of trucks and delivery wagons in Vancouver, B. C., is 232. Of this number 107 are heavy trucks.

Kalish Resigns—D. F. Kalish, general manager of the Hartford Auto Parts Company, Hartford, Conn., has resigned to enter a new field of business.

Brooklyn Federal Moves—The Oriental Rubber and Supply Company, Brooklyn, N. Y., distributor of Federal automobile tires, has moved to 1166 Bedford Avenue.

Bourne Stearns Manager—The F. B. Stearns Company, Cleveland, O., announces the appointment of S. N. Bourne as resident manager of its Philadelphia, Pa., branch.

Shaw Heads American Tire—Adam Duncan has resigned from the presidency of the American Tire & Rubber Company, Akron, O., and has been succeeded by James Shaw.

Bosch to Exhibit—The Bosch Magneto Company, New York City, will exhibit its products at the motorcycle show in Chicago, Ill., during the week of February 3 at space 4.

Hoyme Philadelphia Alco Manager—C. R. Hoyme, formerly sales manager of the International Motor Company, was recently appointed Philadelphia, Pa., manager of the Alco.

Los Angeles Chalmers Moves—The Western Motor Car Company, Los Angeles, Cal., distributors of Chalmers cars, has moved into a four-story building at Tenth and Hope streets, that city.

Kline's Rochester Service Station—The Kline Motor Car Company, Rochester, N. Y., distributors for the Klinekars in that territory, recently opened up a new salesroom and service station in that city.

Beedon Goes to Keeton—Bert Beedon has resigned from the traveling force of the Olds Motor Works, Lansing, Mich., to become affiliated with the selling staff of the Keeton Motor Company, Detroit, Mich.

Two Hendersons in Tour—Two Henderson cars have been entered in the Indiana Automobile Manufacturers' Association's tour to the Pacific Coast, July 1, by the Henderson Motor Car Company, Indianapolis, Ind.

Shadel Kline Sales Manager—The Kline Motor Car Corporation, Richmond, Va., has appointed R. E. Shadel district sales manager for New York State and New England, excepting Connecticut, with headquarters at Rochester, N. Y.

Akron Rubber in Houston—The Akron Rubber Company has established a house in Houston, Tex., for dealing exclusively in automobile accessories. Mr. Fouse is manager. The company will represent the Swinehart Tire and Rubber Company, Akron, O.

Big G. V. Truck Order—The American Express Company in Boston, Mass., recently placed an order for twenty-five 2-ton General Vehicle trucks of the 1913 model. The delivery of these trucks commences in March, and approximately ten vehicles a week will be placed in operation.

Shaffer Invents Gasoline Economizer—W. A. Shaffer, of Waco, Tex., has been granted a patent on a contrivance for use on gasoline engines for automobiles. Mr. Shaffer claims that his invention reduces the consumption of gasoline to practically one-half, the motor being of the two-cycle type.

Lewis to Manage New Company—R. C. Lewis, general manager of the Beaver Manufacturing Company, Milwaukee, Wis., has resigned to assume management of the Lewis Motor and Engineering Company, recently formed to manufacture a line of monobloc motors. The new products will include several European features.

Vancouver Club's Road Doings—One important matter which the Vancouver Automobile Club, Vancouver, B. C., has taken, and which will be carried through to completion early in the spring, is the placing of a log drag on the main highways adjacent to the city. A fund is now being subscribed which will be used exclusively for this work.

Constructs New Furnace—The Milwaukee Gas Light Company, Milwaukee, Wis., has just completed the construction of a new type of furnace for the preparation of automobile springs for the oil tempering process for the W. R. Sherin Company, of that city. The furnace is heated by means of Solvay process gas and the idea is regarded as a real triumph.

Cadillac in New Quarters—The Cadillac agency in Birmingham, Ala., is soon to occupy a new building at the corner of Avenue D and Twentieth street.

New Baltimore Quarters—The Franklin Motor Company, Baltimore, Md., representing the Franklin car, has opened new headquarters on Charles street near North avenue.

Large White Truck Order—The Atlanta Ice & Coal Corporation, Atlanta, Ga., recently ordered 15 White trucks, six of them being 1.5-ton capacity, seven 3-ton and two 5-ton.

Harris with Firestone—R. G. Harris has accepted a position of assistant advertising manager, with headquarters in Akron, O., with the Firestone Tire and Rubber Company, that city.

Opens New Showroom—The French-Schutz Company has opened a showroom on North avenue and Calvert street, Baltimore, Md., where it is handling the Pratt car and Empire tire and Holley carburetor.

Bergstrom Establishes Garage—George H. Bergstrom of Depere, Wis., has established a garage in the McGeehan building, which will be formally opened on March 1. He has not yet selected all of his agency lines.

Join White Sales Force—Frank M. Olmstead, former branch manager in Baltimore, Md., for the Goodyear Rubber and Tire Company, and R. Bruce Hamilton have joined the sales force of the White Motor Company.

Dayton Leaves Columbia—F. E. Dayton has resigned as sales manager of the Columbia Motor Car division of the United States Motor Company, Hartford, Conn., to become general manager of a New York incinerating company.

Appointed Wells Lighting Distributor—The Auto Supply Company, Milwaukee, Wis., has been appointed state distributor for the Wells electric lighting system, manufactured by the R. C. Wells Manufacturing Company, Fond du Lac, Wis.

Bailey Appointed Manager—Henry C. Bailey has been appointed manager of the Hartford, Conn., Auto Parts Company to succeed David Kalish. The new manager was formerly superintendent of the Corbin Motor Vehicle Corporation.

Atwater Sales Manager Patterson—G. S. Atwater has resigned his position as eastern sales representative of the Hayes Manufacturing Company, Detroit, Mich., and has accepted the position of sales manager of the Patterson Rubber Company, Lowell, Mass.

Atlanta Club Elects—At the annual meeting of the Atlanta, Ga., Automobile and Accessory Association, held recently, the following officers were named: George W. Hanson, president; C. H. Johnson, first vice-president; Wylie West, second vice-president, and E. H. Elleby, secretary.

Missourians Meet—A number of members of the different automobile organizations of Missouri recently journeyed to Jefferson City, where a monster meeting was held. Good roads and other things of great interest to the automobilist were placed before the legislature, which was in session.

Brings Suit Against Petrel—County Judge J. M. Becker, of Monroe, Wis., has brought suit in the circuit court at Milwaukee, Wis., against the Petrel Motor Car Company of Milwaukee to recover the purchase price of a Petrel car, $775. and the sum of $197.80, which he declares he spent in bills.

Laxity in Registration—Only 7500 of the 25,000 motor cars in Wisconsin had been registered and licensed for 1913 at the close of business on January 31. While this number is larger than for the corresponding period a year ago it is known that there are hundreds of cars in use which still employ the 1912 license plates.

Abbott Treasurer Universal—M. J. Abbott has become treasurer of the recently organized Universal Farm Tractor Company, which is establishing a factory for the manufacture of motor-driven corn cultivators at Newcastle, Ind. Mr. Abbott was formerly assistant manager of the Newcastle plant of the Maxwell-Briscoe Motor Company.

Golder Appointed Trustee—C. E. Golder of Milwaukee, Wis., has been appointed trustee of the bankrupt estate of the Bates-Odenbrett Automobile Company, which recently failed with small assets. Officers of the concern were examined by the trustee on February 3. Trustee Golder formerly was president of the Curtis Auto Company of Milwaukee.

Two Indiana Bills Passed—Two more bills affecting auto interests have been passed by the lower House of the Indiana legislature. One forbids testing automobiles or motorcycles on any public highway or street, and the second provides where the highway is not visible for 100 feet in advance of a vehicle, frequent signals must be given by horn, bell or whistle.

Van Vliet Business Bought—The Central Iowa Motors Company, Des Moines, Ia., has purchased the business of the Van Vliet-Bradt Motor Company, agent for the Moon car. Mr. Van Vliet has retired from the automobile business, although he will manage the Des Moines show. Mr. Bradt is in charge of the accessories department of the Herring Motor Company, that city.

Middletown Equipping Fire Department—The fire department and council of Middletown, Pa., are considering the purchase of three automobile hose trucks for equipping their fire department. A special meeting was held recently, at which time a number of truck manufacturers were present who were asked to submit their bids before the next meeting of council, February 10.

Large Weaver Deal Closed—The consummating of a deal is reported between the Weaver Manufacturing Company, of Springfield, Ill., and Messrs. W. L. Owen and R. S. Rollman, by which the above-mentioned parties are given the exclusive sales right for Weaver automobile twin-jacks in Chicago, Ill., and northern Illinois, and also the entire state of New York, including New York City.

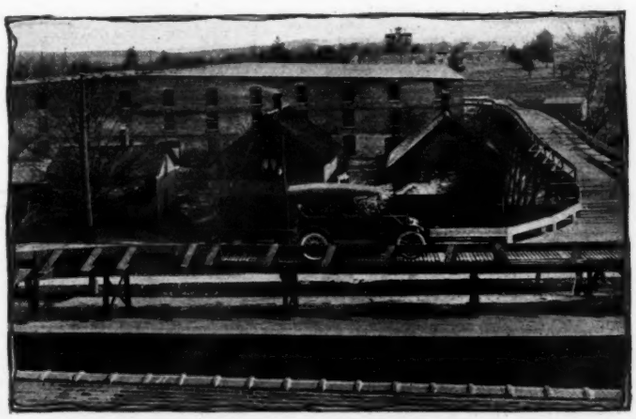
Milwaukee to Green Bay Road—An improved highway from Milwaukee, Wis., to Green Bay along the western shore of Lake Michigan, via Port Washington, Sheboygan, Manitowoc, Two Rivers and Denmark, is contemplated by a campaign put under way recently by Secretary L. E. Meyer of the Milwaukee Automobile Club and Secretary Arthur F. Raab of the Sheybogan Automobile Club.

Want Light Bill Passed—An effort will be made to secure the enactment of a law compelling the display of lights on all vehicles in Connecticut. A bill to this effect has been presented in the legislature by Mr. Pons of Roxbury. For several years motorists have tried to bring about such a law, but were unsuccessful. It is said about the Capitol that there is more sentiment in favor of the bill this season than formerly.

Wolverine Club Elections—All of the old officers of the Wolverine Automobile Club, Detroit, Mich., retired from office recently with the exception of A. R. Miller. Directors were elected as follows: Leonard Davis, J. H. Armstrong, Len Mathews, C. A. Woodruff, F. N. Randall, A. J. Kinnucan and Edward Hines. A smoker was held in the banquet hall of the Tuller Hotel in the way of a grand opening of the new quarters.

Michigan Wisconsin Road Plans—One of the most extensive highway projects ever undertaken in Wisconsin and one which involves $350,000 is the proposed joint plant under consideration by the county boards of Marinette, Wis., and Menominee, Mich., whereby almost every roadway in the two counties will be permanently improved within five years. Marinette county proposed to issue bonds in the sum of $200,000 for the work on the Wisconsin side and Menominee will issue $150,000 for the Michigan side.

Six Months and $500 Fine—Heavy fine and a long term imprisonment will face automobile speeders if a bill drawn by a city solicitor, Schrieber, of Toledo, O., and which he will have introduced in the legislature becomes a law. A fine of not more than $500 or not more than 6 months in the workhouse is provided for the first offence. A fine of $500 and six months' imprisonment is the penalty for any subsequent offence. The new law would make the owner and operator of any automobile violating the provisions of the act jointly liable in damages for any injuries inflicted.



How cars are sent from the assembling plant to the shipping department at the Reo plant. This overhead runway connects the two departments and the cars are driven over into the shipping department under their own power

Opens Broadway Branch—The Twentieth Century Automobile Company, New York City, dealer in automobiles, has opened a branch at 1690 Broadway.

Securities on Chicago Exchange—At a meeting in New York City recently, directors of the B. F. Goodrich Company, Akron, O., decided to list the securities of the corporation on the Chicago, Ill., Stock Exchange.

Goodyear Outlook Excellent—The Goodyear Rubber and Tire Company, Akron, O., is expected to have a gross sale of $40,000,000 this year, as compared with about $25,000,000 for the fiscal year which closed November 1.

Franklin Conference in Chicago—A conference of Franklin dealers of central and middle western states was held at the show rooms of the Franklin Automobile Company, 1450 Michigan Avenue, Chicago, Ill., on Saturday, February 1.

Celina Automobile Company Elects—The board of directors of the Celina Automobile Company, Celina, O., recently organized by electing the following officers: President, Walter Mersman; vice-president, Ira Wagner; secretary and treasurer, Edmund Brandt.

New Speed Bill Introduced—Representative Thomas, of Waterbury, Conn., has introduced a bill setting speed limit for all vehicles, including electric cars, 30 miles an hour, and within the confines of a city or borough 12 miles an hour. Any occupant of the vehicle is subject to the same fine as the driver who violates the provisions—fine of $500, imprisonment for six months, or both.

Peerless Automobile Stock Taken—Announcement is made that all the stock offered to the shareholders of the Peerless Motor Car Company, Cleveland, O., under the plan for an exchange of one-half of common stock holdings for an equal amount of the newly authorized preferred stock has been taken, with the result that the company has now about $2,100,000 preferred stock, $2,100,000 common stock and $1,000,000 bonds outstanding.

State Road Maintenance Fund Advocated—A State road maintenance fund is being strongly advocated by the Tri-City Ocean-to-Ocean Official Highway Association and an effort will be made to have the Iowa State Legislature pass such a bill drafted on the same lines as the New York maintenance bill. Scott County has more miles of macadam road, outside of town and village limits, than any other Iowa county, totaling approximately 100 miles. These roads have cost at the low figure of $5,000 per mile.

New Agencies Established

PLEASURE CARS

Place	Car	Agent
Albany, N. Y.	Hudson	E. V. Stratton Co.
Auburn, Me.	Cole	Auburn Motor Co.
Bagdad, Fla.	Moon	C. M. Munson
Belleville, Ill.	Moon	G. W. Schlender
Boston, Mass.	Keeton	Keeton M. C. of N. E.
Boston, Mass.	Krit	Harrington M. C. Co.
Bridgeport, Conn.	Moon	Drucker, Klein & Co.
Columbus, O.	Great Western	Charles Ross
Evansville, Wis.	Ford	Townsend & Hyne
Hartford, Conn.	Keeton	Keeton M. C. of N. E.
Indianapolis, Ind.	Jackson	M. G. Beckner
Kingsley, Ia.	Moon	M. J. Foft
LaCrosse, Wis.	Detroiter	Arenz-Weihaupt Auto Co.
LaCrosse, Wis.	Marathon	Arenz-Weihaupt Auto Co.
Lodi, Wis.	Ford	J. I. McFarland
Lodi, Wis.	Studebaker	J. I. McFarland
Louisville, Ky.	Brighton	Howard Lothrop
Louisville, Ky.	McFarland	J. J. Caffrey
Milwaukee, Wis.	Case	J. M. Biddison
Minneapolis, Minn.	Chevrolet	Minnesota Motor Co.
Minneapolis, Minn.	R-C-H	Haynes Auto Co.
Montreal, Que.	Commer	J. B. Baileregon
Montreal, Que.	Henderson	International Car Agency
New Haven, Conn.	Moon	J. J. Laverty
Norwalk, O.	Hupmobile	J. V. Metz
Norwalk, O.	Mitchell	J. V. Metz
Norwalk, O.	Paige	J. V. Metz
Norwich, Conn.	Moon	Miss Paula E. Bauk
Peoria, Ill.	Moon	R. L. Collins
Petersburg, Va.	Kline Kar	W. L. Zimmer
Pomona, Cal.	Moon	A. L. Wood
Providence, R. I.	Keeton	Keeton M. C. of N. E.
Raleigh, N. C.	Kline Kar	The Capitol City Motor Co.
Shelbyville, Ky.	American	Hiter-Logan American Sales Co.
South Bend, Ind.	Hupmobile	H. V. Russel & W. M. Yoder
St. Augustine, Ill.	Moon	Sherman Babbitt
Virden, Ill.	Moon	Campbell Bros.
Washington, D. C.	Moon	Frederick Newburgh
Worcester, Mass.	Keeton	Keeton M. C. of N. E.

COMMERCIAL VEHICLES

Minneapolis, Minn.	Little Giant	Eng. Olson Auto Co.
Minneapolis, Minn.	Martin Tractor	Pence Auto Co.

Automobile Incorporations

AUTOMOBILES AND PARTS

ALLIANCE, O.—Alliance Motor Car Company; capital, $50,000; to manufacture automobiles. Incorporators: M. W. Geiger, G. K. Pritchard, R. M. Scranton, J. O. Ellis, C. G. Kline, E. P. Kinney.

BALTIMORE, MD.—Hall Seeley Motor Corporation; capital, $1,00,000; to manufacture motors. Incorporators: M. W. Hall, C. F. Seeley, L. S. Myers.

BOSTON, MASS.—Donovan Motor Car Company; capital, $50,000; to deal in automobiles. Incorporators: F. S. Donovan, A. D. Adams.

BOSTON, MASS.—Universal Truck Company of New York; capital, $25,000; to deal in motor trucks. Incorporators: M. Meyers, M. E. Crable, F. L. Hewitt.

BOWLING GREEN, KY.—Monroe Motor Company; capital, $2,590; to deal in automobiles. Incorporators: I. B. Monroe, H. G. Monroe, G. W. Monroe.

BROOKLYN, N. Y.—Royal Garage and Machine Works, Inc.; capital, $3,000; to manufacture automobile parts. Incorporators: William Schwenn, Louisa A. Schwenn.

CAMDEN, N. J.—The United States Tire Filler Company; capital, $125,000; to manufacture automobile tires and automobiles, etc. Incorporators: R. B. Patton, H. E. Patton, H. R. Gotman.

CLEVELAND, O.—Chandler Motor Car Company; capital, $20,000; to deal in automobiles. Incorporators: Isidor Grossman, Cland W. Shimen, Harry C. Cohn, E. L. Frazer, H. B. Howells.

CLEVELAND, O.—C. H. Tyler Motor Company; capital, $10,000; to deal in automobiles. Incorporator: C. H. Tyler.

COLUMBUS, GA.—Ingram-Joerg Company; capital, $3,000; to deal in automobiles. Incorporators: J. C. Ingram, Robert Joerg, Jr., C. E. Lawrence, R. F. Joerg.

CONNERSVILLE, IND.—Central Car Company; capital, $100,000; to manufacture automobiles. Incorporator: J. W. Burk.

ELMWOOD PLACE, O.—Highland Body Manufacturing Company; capital, $81,900; to manufacture automobiles. Incorporators: William Morrison, J. M. Morrison, R. E. Simons, Jr., George P. Stimson, J. Wilby.

MERCEDES, TEX.—Sterling Automobile Company; capital, $10,000; to deal in automobiles. Incorporators: A. G. Crawford, W. D. Chadwick, G. E. Simpson.

NEW YORK CITY—Brown Car Corporation; capital, $30,000; to manufacture automobiles. Incorporators: W. P. Fargo, H. W. Torney, E. E. Beyer.

NEW YORK CITY—Cortelyou Starter Company, Ind.; capital, $25,000; to manufacture starters for automobiles. Incorporators: J. H. Miller, I. B. Parker, Otto F. Ochs.

NEW YORK CITY—Gas Saver Sales Company; capital, $25,000; to deal in automobiles. Incorporators: C. Fisher, J. H. Miller, E. Cable.

NEW YORK CITY—Gildale Motor Corporation; capital, $30,000; to deal in automobiles. Incorporators: F. W. Strauch, T. P. Gilman, E. S. Peck.

NEW YORK CITY—Harvester Truck Company, Inc.; capital, $1,000; to deal in automobiles. Incorporators: H. B. Danziger, L. K. Schwartz, J. R. Rubin.

NEW YORK CITY—Manhattan Automobile Club, Inc.; capital, $100,000; to carry on an automobile club. Incorporators: F. D. Dorman, A. B. Cordner, E. E. Schwarzkopf.

NEW YORK CITY—Maxim Tricar Manufacturing Corporation; capital, $100,000; to deal in and manufacture automobiles. Incorporators: O. Kuhnenman, C. F. Novotny, A. A. Meschutt.

SOMERVILLE, N. J.—Atlantic Motor & Supply Company; capital, $25,000; to deal in automobiles. Incorporators: A. G. Sleeper, F. A. Sleeper, H. B. Clementa.

TARRYTOWN, N. Y.—Maxwell Motor Company; capital ,$10,000; to deal in automobiles. Incorporators: J. D. Maxwell, J. P. McManus, L. F. Sniffen.

TOLEDO, O.—General Motor Truck Company; capital, $50,000; to establish a system of heavy tonnage transportation via motor trucks by contract. Incorporators: G. R. Grandy, C. O. Morton, F. M. Morton.

TOLEDO, O.—Maumee Motor Car Co.; capital, $10,000. Incorporators: Richard D. Logan and others.

TRENTON, N. J.—Fitzgibbon & Crisp; capital, $100,000; to manufacture automobiles. Incorporator: L. L. Woodward.

WASHINGTON, D. C.—Express Spark Plug Company; capital, $200,000; to manufacture spark plugs. Incorporators: C. H. Duffy, John Loughran, Fred Plugge, John Keane.

GARAGES AND ACCESSORIES

BIRMINGHAM, ALA.—Drennen Motor Car Company; capital, $50,000; to carry on a garage business.

BUFFALO, N. Y.—Rub-On Manufacturing Company, Inc.; capital, $5,000; to manufacture automobile specialties. Incorporators: Otis Bower, W. A. Faxon, W. H. Faxon.

PERU, IND.—Peru Castings and Machine Company; capital, $25,000; to manufacture castings. Incorporators: R. M. Carter, C. E. McCampbell, I. H. Barbee.

PHILADELPHIA, PA.—Tenslon Tire Company; capital, $100,000; to manufacture and sell and deal in and with automobile tires and all accessories thereto. Incorporators: Robert G. Gregg, Howard F. Spellhouse, Geo. L. Townsend.

NEW YORK CITY—Morot Cycle Tire Company; capital, $10,000; to manufacture motor-cycle tires. Incorporators: H. W. Torney, E. E. Beyer, J. E. Beyer.

NEW YORK CITY—United Garage Company; capital, $14,000; to carry on a general garage business. Incorporators: K. Mynter, E. B. Smith, Samuel Ecker.

ONEIDA, N. Y.—Federation Supply Company; capital, $150,000; to deal in automobile supplies. Incorporators: H. D. Crim, Timothy Curtin, A. J. Seaton.

SPRINGFIELD, ILL.—White Garage Company; capital, $12,000; to carry on a garage business. Incorporators: G. W. Taylor, C. W. Luttrell, H. G. Colson.

ST. LOUIS, MO.—Pioneer Steel Block Tire Company; capital, $25,000; to manufacture a new steel motor tire, the invention of Fred W. Karches. Incorporators: W. D. Becker, J. G. Ganahl, Nicholas Le Brun, F. A. Gerber, F. W. Karches.

WASHINGTON, D. C.—District Automobile Service Company; capital, $50,000; to carry on a garage business. Incorporators: G. R. Cowle, L. Bert Nye.

CHANGES OF CAPITAL AND NAME

GREENSBORO, N. C.—Ford Garage Company changed name to McGlamery-Markham Auto Company.

GREENSBORO, N. C.—Ford Garage Company increased capital to $30,000.

WASHINGTON, D. C.—Peerless Motor Transfer Company; change of name to C. B. B. Motor Company.